TEXTILES PAPER LEATHER

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AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XIII JUNE 16, 1924 NUMBER 10

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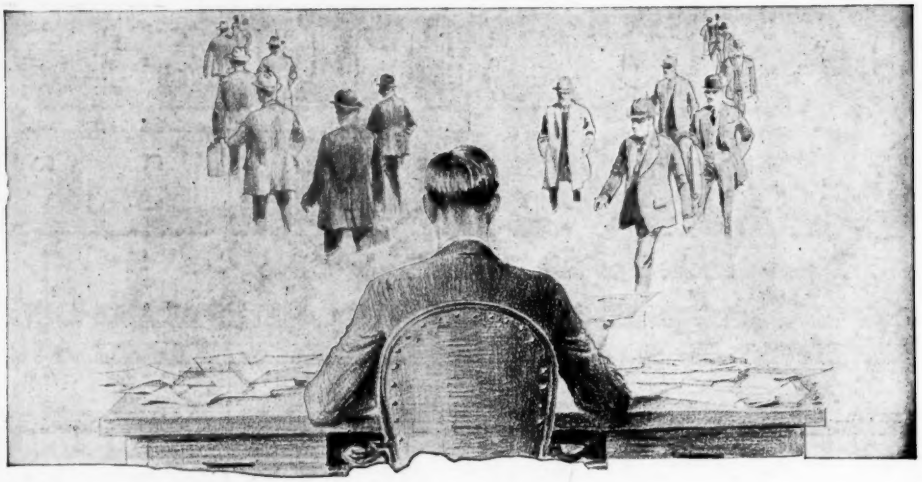

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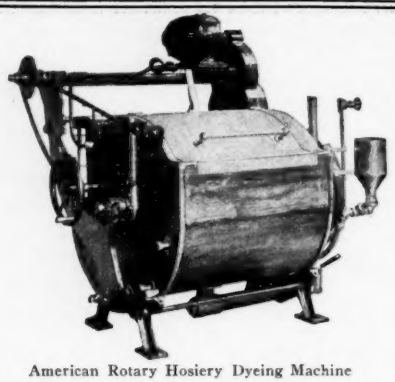

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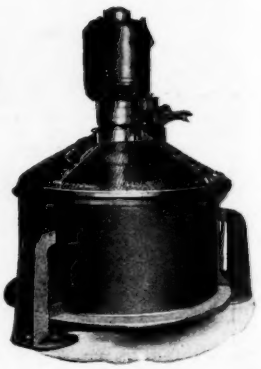

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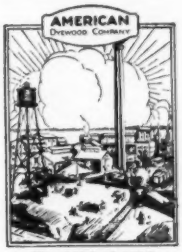

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VOLUME XIII NEW YORK, JUNE 16, 1924 NUMBER 10

The Centralization of Quality-Color Activities of an Entire Textile Business

Three Major Considerations—Relation of the Technician—Requirements of the Work—Plan of Operation —Activities of Departments Touched and Co-ordinated—Purposes of the Work—Method of Procedure—Problems Encountered—Some Unique Discoveries—Bibliography

By HIBBARD S. BUSBY

Consulting Colorist

(Copyright, 1924, by Hibbard S. Busby)

INTRODUCTION: In the process of describing the basic plan of operations by means of which all the quality and color activities of a large textile business may be brought together under one head it is necessary to point out that the individual problem may vary so much for different kinds of manufacturing that the element which requires major emphasis in treatment in any one of them may vary according as the major objective of that business is to manufacture and sell one type of product or another. For instance, a business having under one management large departments for the manufacture of upholstery, dress goods, pile fabrics, colored yarns, decorative fabrics, etc., has a more generalized and interlocking problem (due to the requirements of its problem of simplification in manufacturing methods) than does the business which turns out a great volume of plain colored and standard weave ginghams and calicos, with all its style emphasis upon the production to meet the fluctuating seasonal demand in printed patterns. Again, the fashion element involved in the sale of ribbons, and the intricate problem of controlling production of a very high quality of these, under such rigid methods of control as to assure that a business dealing solely in this commodity may be profitable, a leader in style-quality authority, still *developing* along lines of applied science that are bound to assure its continued growth and leadership, is certain to shorten the application-time permissible to any new method or science which acts in such a manner as to change from the old or existing rule-of-thumb method of carrying out regular routine work. The extreme case of this important time factor is found in the novelty and sports-wear industry, which must capitalize, often, on to-day's newspaper story, reflecting it in to-morrow's product. It may be doubted that such staple lines of production as a great hosiery business and a great manufacturer of men's and women's suitings are this fickle in their fluctuations, but there are many instances where some of the influences which have changed the course of their production had their origin in matters extremely abstract. Real insurance against this element calling for emergency decision on such matters is being worked out through basic research, experience, record and computation (in logical, useful form) of the hidden information assets of such an industry. Some of the methods by which this is being brought about will be described in the latter part of this article.

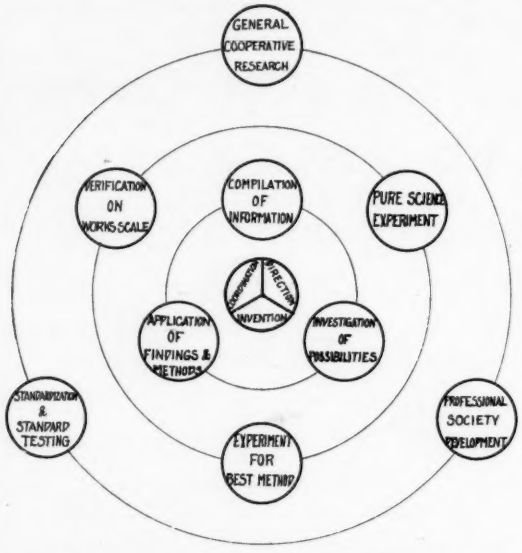
The Three Major Considerations

The functions of any business that are chiefly important must be taken into account heavily in planning the development and operation of such a system as described below, and the importance which each bears to the scheme and theory of conduct of the whole business must be prorated, carefully, in order that the effort may achieve its highest degree of success.

Every business has two major considerations: the satisfactory manufacture of its product and the sale or marketing of it. Even where the merchandising problem is let out to a commission house, or similar agency, the fundamental relation between these two elements must be much the same as if both functions were under one

directing policy, because the closer these functions are co-ordinated in the manner of one business the better their joint chances of economical and efficient functioning.

A third, and very vital factor, enters to-day into the calculations of an installation or development undertaken for any large-sized operation; that is, the influence such an effort will have upon that business as an institution. The trade-name and good-will developed through consistent efforts of advertising and long records of production of market leaders must be considered a trust of the highest order and always kept in view in working out the plan of application, of scientific or operating details, to the whole business. Only such efforts as will result in building up the institution, *without any intermediate period of let-down in any of the quality factors* of the product, are tolerable.



SCHEMATIC PLAN OF ACTIVITIES OF THE DEPARTMENT.

Relation of the Technician

So much has been said and written about the relation of a technical man to modern industry, ascribing to him all the virtues possessed by every desirable functionary, from friend of the business to general manager, that it is not amiss to state the role it is believed he should fill in the capacity of co-ordinator of these vital quality-elements of the business. The conditions encountered in most problems of this kind that have been undertaken indicate the necessity for treatment of the same order as that given by a medical or surgical specialist to a disease that has been difficult of diagnosis, though withal deep-seated and dangerous. The service of the technician is thus one of treatment rather than directive of policy; in fact, there is usually so much to be done that the very best effective use of his time is in an advisory and instructing capacity, rather than executive, at least, until the work and plan is in complete running order.

General Requirements of the Work

The prime requisites of all work for control of quality and color are that its methods be flexible, speedy of operation, and positive in result. The necessity of these qualities is evident when it is realized how frequently the sales department is inclined to come to a department of this kind for instant solution of difficulties encountered, once such a department is available. The rule holds pretty much whether the demand be for a specific detail of research, a matter of check-testing any individual line of product, or giving an opinion on some matter of properties or materials.

Back of all work that is done, if it is to be of anything but of the most temporary character, should be the accumulation of basic material with which to care for the inevitable demands which will flow in, almost with the first broadcasting of the service. In order to be completely effective and far-reaching in scope this material should include:

Records of all work in process already accomplished or being carried on.

Abstract and contributory data on subjects even remotely pertaining to the work in hand.

Requirements and aspirations of the business in the matter of quality and development.

Plan of Operation

For a complete and permanent service the first effort following survey of general conditions is the proper location of the work elements. First of these is an effective laboratory for the testing of materials that enter into the manufacture of the product and for the study of manufacturing problems and the (possibly fewer) abstract physical-chemical problems in pure science which will be unquestionably, encountered. An emergency testing outfit, standardized with the parent equipment at the plant, should be installed at the principal sales office if that office is very remote from the seat of manufacturing activities. The chief technician's activities must, of necessity, be divided somewhat between these two points, though mainly centralized (all things being normal) with the manufacturing department. He may, in addition, on special occasions be called upon to give advice, service, or instruction in method of use, to customers at their headquarters.

The efforts of the service and laboratory are divided into three chief functions: consulting and advice to various heads of process and sales departments on properties of the materials used in manufacturing and means to improve, standardize or alter them or on the lines of application to which they are suitable—check-testing control of materials, processes and products for alignment to essential properties and uniformity—and research on current problems of properties of materials, process methods and inspection methods, together with basic research,

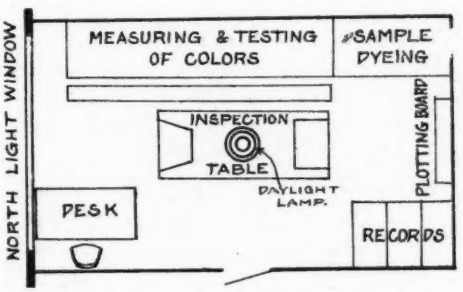
made with the objective of improving the product, increasing its degree of standardization or further developing its properties for sale ability in additional markets.

Activities of Departments Touched and Co-ordinated

Some idea of the detail included in this program of color-quality centralization may be realized from an enumeration of a partial list of the problems which have been encountered within the scope of the three main activities of the business.

In connection with work to assist the activities of the sales department the color-quality department registers, by means of a standardized system of measurement, the ground and pattern colors of the various prints and then works out a line of simplification by means of which the design department is furnished with a proof-palette of colors from which they can create new designs, *with the assurance that these colors can be duplicated exactly in print-room formu'a*. These formulae are then worked out, in terms of fixed proportions of standard-strengths of dyes, and the purchasing inspection of the dyes at the mill laboratory assures their repetitivity to the print-room color mixer. Formulae, based on this dye standardization, are furnished the mixer for this purpose. A definite part of the work in this department is the building up of a *general* color-palette, which is gradually worked up and simplified as conditions permit so that, eventually, the print and other design departments may choose therefrom any combination of colors that are of the mode. Revision of the existing color combinations of patterns into better accord with known laws of harmony take place here as well as elimination of duplicates, all these latter being gathered under one printing room formula designation for each group of duplicates.

Data obtained from survey of the exact color demand in plain colors is charted and used as the basis of getting out this line of work for dress goods, and in connection with this and the print patterns the *exact* colors decided upon are made the basis of written customer guarantees for exact repeats in shade, so as to assist the activities of sales-service. The general fastness properties of each color in this standard list are all this time being worked on by a system of elimination by inspection which eventually provides for the desirable properties in each of the standard-palette shades.

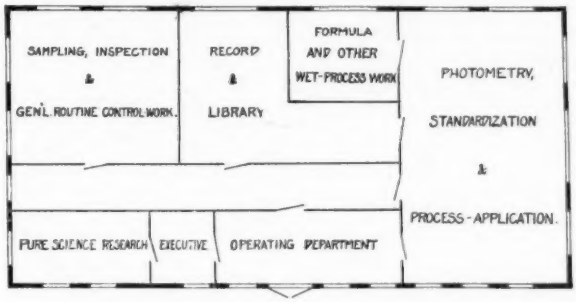


PLAN OF A SMALL COLOR-QUALITY UNIT.

Complaints of customers are scrutinized and the department acts as arbiter between the claims made and the conditions which actual tests show to exist.

Surveys of the various fields into which the different yarns and fabrics are sold are next made to discover and reduce to a measured-control-of-properties basis the most desirable properties which each should possess in the dual fields of suitability and permanency.

Historical records and the other factors upon which style-cycles in color are dependent are prepared for the assistance of the sales department in choosing a seasonal line of colors. The chief advantage of such data lies in its utility in the matter of putting dyehouse orders well ahead of sales demand, thus enabling concentration of sales plan upon a line of production made under the most advantageous conditions of cost, due to production in mass rather than by special emergency dyeing order.



PLAN OF COLOR-QUALITY DEPARTMENT FOR A LARGE INDUSTRY.

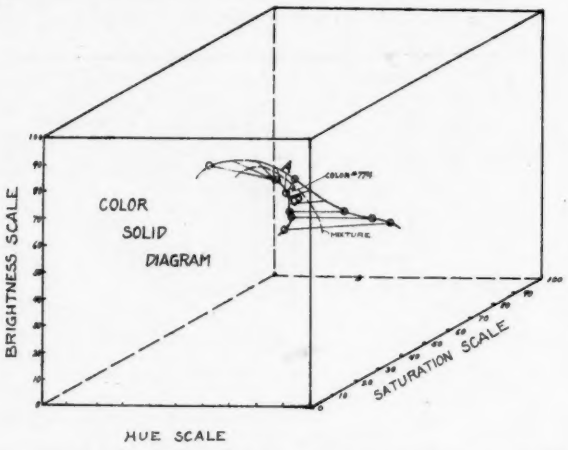
The standardization, arrangement and choice of exact colors in the sample cards issued for the sales department is another activity. Obviously, these colors, too, are standardized in the matter of production formula as well.

It will be observed that much of the work carried on for the sales department has a dual or detailed carry-out in the manufacturing activities. In addition to these items there is a myriad variety of small, every-day works problems, and a considerable number of general problems of which the following serve to illustrate:

1. The various departmental lists of colors are measured, charted on one central reference system with corresponding departmental designation, and thereupon serve as an index of colors needed for future designing or new and old production reference. In this grouping much simplification may be accomplished, together with providing means of affording a basis of always having at hand for reference a much larger color list than that currently used by any one department. This is of great value in emergency seasonal work.

2. Then, too, a considerable amount of detail work has to be done in alignment of the routing of such matters as repeat orders, production of equivalent colors in varying textures, and the make-up of suitable combination schedules in mixture-colored cloths. A system of daily quality inspection is developed, of which the mill

laboratory is the responsible head. Each color and finish production department has its product passed through this system, which undertakes the gradual elimination of the *causes* of defects in quality, pointing out their nature and furnishing means to avoid them in later production. Subsidiary (optical) means of more minute inspection of the various preliminary stages of production are also developed by the laboratory and installed at the various points in production departments where quality defects can most economically be arrested. Instruction is also given in their use.



Layout, in theoretical color solid, of graphic solution of the problem of finding *all* the color mixtures produced from two suitable dyestuffs, A and B.

By locating, on the color solid diagram, any color it is desired to produce (as No. 774), it is shown, by whether or not this desired color falls upon the "mixture plane" of the two dyestuffs, if the two dyestuffs, *unaided*, are sufficient to produce the color. If not, the nature and location of the proper dyestuff which must be added *to do this most economically* is shown by the location of the desired color with respect to other "color tendency curves" plotted thereon.

In practice, the diagram is replaced with an optical device which shows the various "tendency curves" in three dimensions. For convenience in printing in this article this effect is represented in isometric projection.

3. The selection of the most representative exact shade in each group of near duplicates (caused by the "wandering" of a color through successively repeated production) is work calling for very thorough research into the purposes for which each color is used. This work and the development of keyed reference codes for the various color ombres regularly carried in stock becomes a fairly important matter to the cost department, the planning department and the company's art director, no one of which has facilities or time for doing this very necessary work properly.

4. Schedules have to be prepared (on the basis of properties and manufacturing requirements) for the purchase, standardization and inspection-control of the various elements which, entering into manufacturing, affect its quality, color, finish or texture. The studies for this purpose are based upon best degree of adaptability (in the ratio of adaptability/cost) of each to the special purpose for which it is to be used. Some of the items covered are as follows:

Degree of smoothness of various fibers required for use in close-woven gloss satins.

Hue requirements in dyes developed for self-colored fibers in bond-paper filler.

Color allowance (yellow to white) of tram which may be used, unbleached, for colors dyed in strengths below one-half of one per cent.

Dyestuffs most suitable for production of each plain hue which is a standard color carried in permanent stock.

Change in dyeing formula necessitated by change in count of yarn used in the structure of a certain cloth.

Proportion of each color necessary to obtain a required shade of heather mixture.

Customer guarantees, matters of complaint, and work to improve suitability and permanency properties are functions which contribute to the enhancement of the entire business as an institution. So does the detail work of standardization of all manufacturing activities which improves, stabilizes and increases the assurance and reliance which can be placed upon the advertised quality behind the trade name. Behind every effort of this kind should be exact information of the trade requirements in this respect so that the objective of the work may be to surpass, anticipate and create new achievements *beyond what is actually required*, for the purpose of putting the product always in a position where it is eagerly sought rather than requiring hairbreadth methods of unloading. Consideration of the business served as a vital institution, serving the requirements of a great body of discriminative consumers, is the safest and surest guide of the point of view of this work. The work exists, to a great degree, for the building up of reliance upon such institutions. It is a necessary function of Institutional Business.

Purposes of the Work

In detail, the means of achieving this objective lie through very simple and naturally performed steps. But they do require patience and constant application to all the items encountered, together with constant adherence to the vision of the chief motive of the work.

In every step accurate records of what is found to be the conditions existing in the various departments are the basis upon which all conclusions and development must be built. Facts and not speculation are necessary to the rapid evolution of any plan in big business.

Standardization—exact measurement and notation in unambiguous terms of the various properties and differences in all the materials and standards of manufacturing reference—is basic and essential.

Simplification follows closely and is a secondary activity of standardization. It should include reduction to the minimum of all the expense of operation and record-keeping detail.

The control of all basic materials entering into the various processes is fundamental to a proper degree of

reduction of cost to a minimum. It is achieved only through rigid comparison of their properties and adaptation of the fit ones to the specialized production demand. Most of this work can be carried on, in routine, very rapidly by comparative studies following a preliminary standardization-study of each type-material.

A thousand opportunities will be presented for improvement of process details. From the little matter of filing samples to that of using up and elimination of remnant stocks every one of these is an aid to the balance sheet as well as the annoyance feature of business difficulties.

First, last and always the matter of quality; the elimination of slack practices and thoughtless procedure in handling valuable materials as well as the development of carefully detailed procedure for production of high quality finishes and color patterns should all be tied up to one centrally-controlled inspection system *based upon absolute measurement* in place of the older methods subject to the variables and vagaries of opinion. The industry of instrument-building is by no means a perfect art to-day, but it has achieved remarkable progress and there are available devices which can be adapted easily to the control of the major problems of inspection of the quality factors in textiles.

In all the activities of quality—promotion work opportunities for vital invention and research will suggest themselves at every turn. There is little chance that an active and conscientious worker in the problem will ever merit the criticism that he follows will-o'-the-wisps of his own imaginings. So many little but important matters dependent for their solution upon scientific research present themselves daily, and so many serious problems of long standing afflict the industry that there is more than a lifetime of work, in the whole field, in dealing with and solving these problems. Solutions of some of the matters already covered will be referred to below.

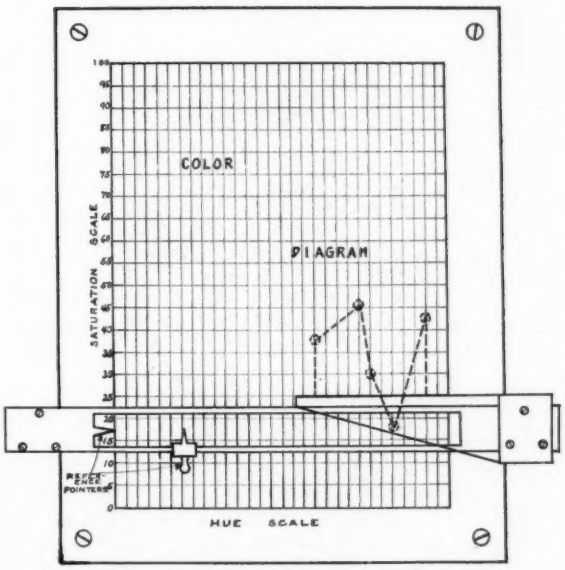
Method of Procedure

The previous paper of this series has outlined the skeleton of such a department as is best adapted to the permanent organization of an activity such as we are describing. In a sense, however, the criteria of organization and equipment for this work that are most vital to any representative effort in this line lie fundamentally in the attitude of mind in which the problem is attacked and carried out as do also the benefits of encompassment of an assembly of equipment such as can best come under the control of one directing spirit of the work.

The attached reference list includes certain papers in which some of the detailed problems of this work are explained, while the accompanying diagrams set forth the *principles* upon which very large or even small units may be built up—the size of which depends upon the demand existent. The actual procedure and equipment for putting the work into active going shape on this centralized basis referred to is about as follows:

1. A testing office, equipped with proper daylight lamps and color comparator, is installed in some convenient central portion of the plant. Other things being equal, this should be located as near as possible to the dyeing and finishing department. Sample cabinets should be provided, together with corresponding color-analysis record sheets upon which to record the instrumental measurement of each mill standard and sample card color. An assembly plotting board should next be provided for general assembly of *all the colors used in the business.* This should be ample to handle the complete visible color list and be of convenient construction for the location of any color by mill code designation as well as instrumental color measurement. Where the list of sample card colors is a large one there is justification for the installation, also, of a high-grade colorimeter for detailed measurement and recording of them. Small lists can be more inexpensively measured in outside service laboratories, of which there are several in commercial operation.

2. Every record made is important, chiefly because of



COLOR PLOTTING-BOARD

The sliding arm is provided with clamps for holding any color-group diagram which may be used to isolate reference to any particular combination or grouping of colors suitable as the basis of print-designing or jacquard combinations. (One of these is shown in place, in dotted outline.)

The colors, as measured, are charted in their proper positions on the color diagram, a departmental code symbol for each being marked on the chart in the place in the color diagram which its measurement indicates.

Brightness, the third factor of measurement of any color, is indicated by the code symbol in which the color is registered.

Use of the board is as follows: (1) A color of desired measurement is located by cross-reference to the data on the diagram. (2) A combination of colors is located by setting the reference pointers at the points indicated by scale numbers furnished with each design pattern, whereupon the color-group diagram points to all the colors suitable to the combination. These diagrams are worked out through study of desirable combinations for groups of print or jacquard patterns, as described in the text.

the bearing each has upon the matter of prevention of the danger of slipping from exact standard of manufacture, therefore chart books and wall charts of each departmental activity must be kept very carefully.

3. As the work progresses, the details of record-keeping should be turned over to a competent clerical assistant, in order that the major efforts of the man in charge may be devoted to applications of the work to process.

4. Next, samples of each lot of production (preferably a skein from each yarn-dyed lot and a patch from each piece-dyeing, as well as swatches from whites and blacks) should be routed through this department, inspected and given a comparative rating against the standard. Inspection of printed goods may be made in the print room in order to avoid undesirable cutting, from the piece, of a whole repeat motif (which has to be examined). The *tendencies* of deviation from standard are taken up with process department heads and the causes discovered and remedied—it may be that improper materials are being furnished the departments affected.

5. Next the matter of laying out purchasing standards of the various process materials is gone into in great detail; as the progress of this work and the recording of all the colors in the mill and sample card lists may take considerable time there is opportunity during its course for the development of standard formulas in print room, dyehouse and finishing room, studies of process details to determine their net effect upon all quality elements and set-up of inspection methods in each department on the basis of the recorded-measurement practice of the testing laboratory.

6. Thus it will be seen that the work develops itself through various stages, getting deeper and more vitally into the elements which affect manufacturing results as it goes. Little problems, too numerous to mention here, will come to the department without solicitation, and a man must apportion his time carefully in the order of the importance of the work. The basic standardization and simplification work should never be allowed to lapse, whatever happens. As the work in the plant progresses the various items involved in customer complaints, together with the matter of style-prognostication calculations should be taken up with the various sales units and the details of these findings correlated into records, experience data for future reference, and their value to the business of selecting proper seasonal color lines and making up sample cards taught these departments, as well as the best arrangement of such sample cards for most effective selling value. Here the technician should sit with the stylist, sales director and sales-service and advertising department heads in order to incorporate these developments into their activities.

7. A great many methods are available for practical correlation of the progress of the various activities of the work into the departments of the business. Color lists, design patterns and reference systems of standards of all sorts used in the various departments should be subject to periodic inspection, alignment and analysis. One of the best aids to this work is the issue of a departmental status book to each department, containing in it an accurate statement of the status of all standards used in that department. Each of these is duplicated in a master book in the quality department, and changes of all sorts are registered in each place by that means.

8. In order to assure that the right conditions surround inspection at the various stages of progress of the product, it is nearly always necessary to have a system of inspection and follow-up of these departments, and to take especial care in this system that daylight, artificial light and cleanliness conditions are rigidly lined up to as specified.

9. It may be well to bring together certain process department executives, as the work progresses, and explain to them the theoretical and practical questions involved in the work, to the end of developing that interest in its progress without which there is never any great degree of co-operation.

Some Problems Encountered

From a list of some two thousand or more quality problems met in practice, a few may be cited as illustrative of the place filled by this work.

1. Examination of matches of a standard seller in piece goods, that had been carefully preserved from each lot turned out during a protracted period of production, disclosed that not only had the various lots of production wandered from the original standard, but the standard itself had degraded, due, first, to deterioration of the several pieces of the original standard and, second, to substitution, later, of imperfect matches therefor. The condition was corrected by means of instrumentally-recorded basic standards and periodic check of the reference standards issued to various process-department heads.

2. Yarn remnants of various lots of a certain prominent shade were assembled with a view to their use, as one lot, in place of dyeing up a new lot of the color for an emergency order. They failed so completely to match that this plan had to be abandoned. The process of dyeing this particular color was so expensive that it was a paying proposition to have all future lots of it passed directly by exact colormetric inspection prior to their release for weaving. Due to the use made of the fabric into which this yarn was incorporated, not only the visual color but the degree of the fluorescent properties of this color were included in the specification which it had to meet in each lot.

3. A graphic colorimetric investigation of the dyestuffs adaptable to a standard line of narrow-fabric production in a limited ombre of shades disclosed that whereas each color in the ombre might be dyed, suitably, by using a number of different dyestuffs, it was possible to dye the ground shades of the whole series by using varying proportions of only two dyes and indeed completely dye all but two of them by this means. The two remaining num-

bers were brought to the desired shade by toning off with a relatively insignificant amount of a third dye. Thus the dye purchasing for this group was so narrowed down that better prices for quantity lots could be taken advantage of, the dyeing operation was simplified, and the frequency in number and degree of off-shade lots was reduced to a minimum.

Some Unique Discoveries with an Economic Application

After witnessing some of the industrial improvements accomplished with and through the kind of a system outlined above it is very difficult to restrain one's enthusiasm in prophesying the possibilities that lie within it. Therefore, it is better, perhaps, not to touch on these but to confine oneself strictly to those projects which have been actually carried out and seen in their finished state. Such things will undoubtedly appeal more to practical men at this embryonic "state of the art."

1. For instance, take what we have learned about color, texture and finish as related to matters of style demand. (The whole of the findings in this matter, things of definite application, too, would fill a large-sized book.) We know that there are cycles of color-return-to-popular-demand and that the period of these cycles is dependent not only upon years but upon the order in which the phases of the cycle have run, also that the only colors which can be said, truly, to run in cyclar fashion are grouped within a very small total number of regions of all the colors existent.

This same research disclosed, also, that there are certain colors and color combinations that will always have sales appeal—it gives, further, the reason for this fact. Further information derived, as auxiliary to this matter, is that of the most suitable textures adaptable to a given color and vice versa. This information shows us why certain colors and color combinations will never "go" long on some textures, and gives us a great deal of assistance in selecting the proper styling schedule for special textures like knit goods, mesh, pile fabric, and unique texture designs.

2. Then there is the matter of selection of the number, graded steps and exact colors of ombres in any hue (a very vital matter in getting out a line of plain colors and making up the sample card for their display). The type of display card used is an extremely vital factor in this problem, and the direction in which the ombre should run (i. e., all of one hue, a gradual change in hue or a constant alteration in hue) is a matter solved on the basis of a very thorough study and practical trials made, so that it is now possible to determine, with absolute confidence, what should be manufactured. This has been done so thoroughly as not only to check from psychological tests, but to accord with trade experience and observations made over a very wide range of industries, like textiles, paint, paper, rugs, linoleums, wood finishes, fresco material, etc.

3. In the early stages of determining dyestuff properties by a physical basis of examination rather than a chemical one, one of the difficulties encountered in practical application of the work was the time it took to make the various tests essential to a determination of the complete list of properties of each dye and of samples from successive lots. Eventually, a long list of dyestuffs was tested and check-tests of these findings disclosed a shorter method, by means of which the comparative properties of successive shipments of a given dye were determined by means of one complete study (on the type dye), and very brief check-tests of salient points on the lots delivered later. This led to a positive method of identification of any synthetic dyestuff, tabulation of the possibilities open to a dye in formula combination with other dyes, a means to reduce the number of dyes in a given formula, shortening of the time required to make service (wearing) tests of the dyes (alone *or in combination*), formulation of an exact means of relative tabulation of the useful (and hateful) properties of a dye, and means to predict the effects, in process, of a number of hitherto unconsidered properties of dyestuffs. In short, it opened a whole new field of discovery of peculiar and yet vital properties of dyestuffs that were based upon their nature, were measurable, and determinable within a reasonable amount of study-time upon the *type* dye. As the list of dyestuffs examined in this way has been considerably extended since the first work, and as work is constantly in progress to align the original findings with later production of dyes marketed, the scope of *formula development* and *knowledge of relative useful rating of dyestuffs is in fair shape in some quarters.* Indeed, as the work has progressed, even the time required for the *basic* study of an altogether newcomer to the field of dyestuffs has been shortened—the experience on the first work having pointed out certain physical groupings (into which all dyestuffs fall) that are determinable by means of a somewhat foreshortened though vital series of tests to which these may be subjected in order to classify them according to this new grouping.

4. As the laws governing color combination and arrangement are better understood we find a number of definite factors in printed and jacquard designs which can be readjusted, with confidence in the correctness of the change. Not only are such factors as the exact color to be specified in each element of a design, the proportional area which each color should cover, the proper and color-balance arrangement which each item should possess—of great assistance in improving the quality of textile design, but actual realignment and improvement of the "line" and "mass" elements of such designs are effected by application of these physical and physiological-psychological principles so that a competent color-analyst can greatly enhance the appeal value of the design through a definite and detailed critique of same, prior to its carry-out in manufacturing.

5. But of all the very most remarkable facts connected with color-technology, the one of perhaps the greatest

interest to the textile field is the tie-up and vitalizing element this work has on *all* the important functions of trade-name and established reputation, dominating as it does every phase of activity contributing to that end. The foregoing work has outlined how the important matter of quality of product is handled and the factors of texture, finish, proper design and color are brought under a definite system of control. Experts in the other vital lines of business activity, such as advertising, credits, sales and sales-service will bear out the statement that this work effects a marked influence upon their individual activities in detailed ways too numerous to mention in this article.

In the matter of display or truthful pictured representation and publicity, through savings effected in operating expense, in the equitable arbitration of complaints and other matters affecting returned goods (as the Silk Association is recognizing in current activities) in facility of stabilizing the problem of uniformity of service to the promotion of customer good-will, and in reduction of delay in meeting delivery schedules every large, well-run industry can testify to the place the items mentioned above enter into the affect established reputation. Their economic reaction, therefore, is well known to persons in key-executive positions within the industry.

For these reasons it is cause for wonder that the activities, investigations and pure science work toward new scientific discoveries being carried on in this line are left entirely for a few representative companies within the industry (who have had the vision) to put across and incorporate, instead of the whole industry's sharing the burden of this pioneer work—for a corresponding share in the dividends it pays. Endorsed by the highest business authorities, commercial, financial and a advisory, it has reached that status of a department in modern business organization that has come to stay.

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Benzene in its Relation to the Azo Dyestuffs

Preparation of Benzene—Formation of Compounds—Azo Coloring Matters—Amines—Other Bases Obtained—Sulphonilic Acid—Developing and Diazotizing—Insoluble Azo Colors

By W. B. NELSON

COAL TAR is produced by the dry distillation of coal, and is therefore a by-product in the manufacture of coal gas.

Coal, being a substance rich in carbon and poor in hydrogen, furnishes on dry distillation substances which belong almost exclusively to the aromatic series, and by far the larger proportion of the aromatic compounds used in the preparation of the artificial dyestuffs are either prepared directly from coal tar or are formed from intermediate products prepared from substances present in the tar. One of the most important of these is benzene.

We might say here that the series of aromatic substances, of which benzene is one, are so called because the first hydrocarbons discovered were obtained from aromatic balsams and resins.

The products from coal tar vary according to the temperature of its distillation; its purification and division into its various component parts is effected by distillation. The crude tar, which contains a considerable quantity of ammonia water, is first freed from this by gravitation. It is then transferred to the stills, which are vertical and connected with a worm surrounded with water, which can be cooled or warmed as the occasion may require.

The tar in the stills is kept in motion by means of

mechanical stirrers, or by passing a current of superheated steam into it. The first operation consists in separating the distillate into four fractions:

1. The *light oil,* consisting of that portion of the distillate which passes over up to 150 deg. Cent., and which contains benzene, toluene, xylene, etc. (This fraction floats on water, hence its name.)

2. The *middle oil,* B. P. 150 to 200 deg. Cent., consisting of phenol, naphthalene, etc. (Has a specific gravity of about 1.)

3. The *heavy oil,* B. P. 200 to 310 deg. Cent., consisting of phenols, naphthalene, quinoline bases, etc. (Sinks in water.)

4. The *anthracene oil* B. P. 300 to 400 deg. Cent., which contains anthracene. This last fraction, from its color, is also termed "green oil." The residue in the retort is run out and is known as "pitch."

These four fractions are now subjected to further purification. Each fraction is first washed with dilute acids, and then with alkalis—in the first case to remove the bases, and the second to remove the phenols, etc.; or, in some cases, what is better—to begin with the alkali washing, followed with dilute sulphuric acid, and finish with a weak solution of caustic soda. It is finally washed with strong sulphuric acid and then again subjected to careful fractional distillation, one or the other of the various fractioning columns being employed in order to effect complete separation.

In this way benzene and toluene are obtained pure. The three xylenes, which, owing to the similarity in their boiling points, cannot be separated by fractional distillation, are not separated, but are used as commercial xylene.

Preparation of Benzene

Benzene (C_6H_6), as we have shown, is produced from the light oil obtained in the distillation of coal tar; it may also be prepared by heating benzoic acid with lime, when the acid breaks up into carbon dioxide and benzene; or, by simply heating acetylene.

Benzene is a colorless ethereal liquid of specific gravity 0.899 at 0 deg. Cent. It has a peculiar, pleasant odor, and boils at 80 deg. Cent. It is very inflammable, and burns with a red smoky flame; but its vapor when mixed with either hydrogen or air, as in coal gas, burns with a bright white flame. It is insoluble in water, but dissolves in ether and alcohol.

If benzene is dropped into strong nitric acid, or into a mixture of ordinary concentrated nitric acid with an equal volume of strong sulphuric acid, a violent action occurs, red fumes are evolved, and the liquid becomes red. On pouring it into several times its volume of water, a heavy, oily liquid falls, which is nitrobenzene ($C_6H_5NO_2$). This is called nitration and the benzene becomes nitrated. The province of the sulphuric acid is to unite with the water, since weak nitric acid does not act on benzene, and thus to remove the water from the nitric acid and make it anhydrous.

Nitrobenzene has an exceedingly strong flavor of almonds, and is sold, dissolved in alcohol, as *mirbane essence* to the manufacturers of perfumery. Nitrobenzene itself is also known as *oil of mirbane.* It is the source of aniline by reduction, and has a specific gravity of 1.2 at 0 deg. Cent. and boils at 206 deg.

If the mixture of nitric and sulphuric acids mentioned above is boiled with benzene, the liquid, on cooling, deposits a yellowish-colored crystalline solid known as dinitro benzene ($C_6H_4(NO_2)_2$), a compound used in the manufacture of some explosives. Strong sulphuric acid also reacts with benzene, when heated with it, part of the hydrogen being replaced with the sulphonic group, or sulphuric acid residue, which bears the same relation to sulphuric acid as nitryl bears to nitric acid; thus: $C_6H_6 + SO_2(OH)_2 = H_2O + C_6H_5.SO_2.OH$ (which is benzene sulphonic acid). If fuming sulphuric acid be used, a second atom of hydrogen may be replaced, forming benzene disulphonic acid.

When strongly heated in sealed tubes or when slowly passed through strongly heated open tubes, condensation and decomposition go on together, acetylene, diphenyl, diphenylbenzene, etc., being formed with evolution of hydrogen and deposition of carbon. There can be little doubt that toluene and xylenes can be also produced in this way; and since Berthelot has shown that toluene and xylene when passed through strongly heated tubes can produce anthracene and naphthalene, and since he also obtained anthracene by so treating a mixture of benzene and ethylene, we may assume that if benzene is not the mother substance of the whole series of hydrocarbons obtained from coal tar, it is yet capable, under proper conditions, of generating all the others.

Formation of Compounds

As we have shown, when benzene is subjected to the action of strong nitric acid (anhydrous), substitution of hydrogen by NO_2 takes place with great ease. If the mixture is kept cool only mononitrobenzene is formed, but if heated three dinitrobenzenes are produced, the metadinitro product (m. p. 89 deg.) always greatly predominating. The ortho and para compounds can only be produced in quantity by indirect methods. Trinitrobenzenes can only be obtained by the action of a great excess of a mixture of nitric acid and fuming sulphuric acid. All the nitro compounds on reduction with appropriate reagents, such as iron, zinc or tin, in the presence of an acid, preferably hydrochloric acid and water, yield amine compounds corresponding with the nitro compound reduced. Such are aniline, the three diaminobenzenes or phenylenediamines, etc. The amino-compounds, by the action of nitrous acid or the nitrates in the presence of an excess of acid, preferably the hydrochloric, are con-

verted into diazo-compounds. If a diazo-benzene salt —e. g., $C_6H_5.N_2Cl$—is dissolved in absolute alcohol, and the solution heated, the nitrogen is evolved as gas while the benzene is regenerated. If the diazo salt is dissolved in water and boiled in the presence of an acid, nitrogen is also evolved and the corresponding phenol is produced. The diazo compounds react with certain amino compounds or phenols, giving rise to the almost innumerable series of coloring matters known as azo dyes. Solutions cooled with ice should always be employed, and all rise of temperature must be carefully avoided. Under proper conditions some diaro-compounds attack the *amino* group of amino compounds, forming diazo-amino compounds such as diazo-aminobenzene. These can be made to undergo an isomeric change, resulting in the formation of what are known as the amino azo compounds, of which amino azo benzene is a typical example. Such substances when treated with a reducing agent split up into an amine and a paradiamine, while diazo compounds yield hydrozenes only and diazo amino compounds a mixture of a hydrazene and an amine. If the nitro compounds are submitted to the action of alkaline reducing agents in alcoholic solution, such a solution of zinc dust in alcoholic soda, the reaction takes a different course altogether. The action of alcoholic soda and heat alone will convert nitrobenzene into azoxybenzene; this, by means of nascent hydrogen, is converted into azo benzene, which under the action of this same reagent is still further reduced to hydrazobenzene. The latter when boiled with an acid is converted into a salt of benzidene (paradiaminodiphenyl), which is a strongly basic compound isomeric with hydrazobenzene.

Azo benzene ($C_{12}H_{10}N_2$) is a product of the partial reduction of nitrobenzene. On a large scale azo benzene is produced by the reduction of nitrobenzene in alcoholic solution with zinc dust and aqueous soda. In this reaction the reduction is apt to go further, and some hydrazobenzene is also obtained. This, however, is readily oxidized to azo benzene if nitrous fumes are passed into the alcoholic solution of the product. Weak reducing agents, such as zinc dust in alkaline solution, convert azo benzene into hydrazobenzene, but benzidine is obtained when stronger reducing agents, such as sulphurous acid, are employed. When melted with paraphenylenediamine in the presence of ammonium chloride, it yields a soluble induline dye. Azo benzene yields a mixture of mono-, di-, and trinitro azo benzenes when treated with fuming nitric acid.

Azo Coloring Matters

The coloring matters of this class contain one or more azo groups—N:N—linking together aromatic radicles. The typical parent substance from which these compounds may be regarded as being derived is azo benzene. The basic and acid derivatives of azo benzene are all coloring matters, the amino derivative amino azo benzene having been the first which was prepared and introduced into commerce on anything approaching a large scale. This substance was prepared by the action of nitrous gases (nitrite of soda) on aniline dissolved in alcohol and was known in the market as "Aniline Yellow," the true constitution of the color being, at that time, unknown.

Benzene may also be nitrated by using sodium nitrate instead of nitric acid. A recent recipe is as follows: Thirty-five kilos benzene, 115 kilos of sodium nitrate are mixed at 60 to 80 deg. Cent. and 150 kilos of 90-96 per cent sulphuric acid are added slowly. The temperature rises to about 100 deg. Cent. when 65 kilos of benzene are added, and when the nitration is complete the lower layer of bisulphate is drawn off.

Dinitro benzene is obtained by treating a charge of the hydrocarbon (benzene) with double the proportion of the mixed acids, or the nitrobenzene already manufactured may be taken and again treated with the necessary acids. The principal product of the reaction is metadinitrobenzene, but ortho and para dinitrobenzene are also produced; it should not contain any nitrobenzene and should be well crystallized, hard and almost odorless, and should not render paper greasy.

When treated with concentrated sulphuric acid or treated in the cold with sulphur trioxide in sulphuric acid, sulphonic acids are produced by substitution of HSO_3 for hydrogen. These are either mono-, di-, or polysulphonic acids, according to the treatment adopted. They are all powerful acids, and form well-defined and generally well-crystallized salts with sodium, potassium and ammonium, and equally definite though less easily crystallized salts with calcium, barium, iron, copper, etc. These, especially the sodium or potassium salt, if fused with caustic potash or soda or heated under great pressure (40 atmospheres) with aqueous soda or potash are decomposed with the production of a sulphite of the alkali metal and conversion of the benzene residue into the corresponding hydroxy- or phenolic compound.

Only the methyl homologues of benzene will be considered here, as they are the chief ones which occur in coal tar. The mono methyl derivative is known as toluene and under all treatments behaves as a completely homogeneous substance. The dimethyl derivative is known as xylene, the substance of that name occurring in coal tar, which occurs in three isomeric compounds: ortho-xylene, meta-xylene and para-xylene. Each of these three different xylenes is, however, absolutely identical in percentage composition. Toluene and xylene generally react under similar conditions in the same way as benzene, producing a similar series of compounds. Since, however, toluene itself is a mono-substituted benzene, mono-substituted toluenes are really di-derivatives of benzene. It fol-

lows, therefore, that, the xylenes being di-derivatives, their mono are tri-derivatives of benzene.

Amines

Amines or ammonia bases may be regarded as substances derived from ammonia by the substitution of hydrogen radicles for hydrogen. They may be looked upon as derived from hydrocarbons by the replacement of one or more hydrogen atoms by NH_2 or its alkyl substitution products NHR or NRR'. The definition of the term would include alkyl derivatives of hydrazine and hydrazoic acid, and compounds such as nitros—amines, diazo-compounds; and others which contain nitrogen linked to nitrogen or elements other than carbon, as well as to alkyl residues.

Amines are known as primary, secondary, tertiary or quarternary amines, corresponding with the number of hydrogen atoms that have been replaced; it is evident, therefore, that a quarternary amine can be derived only by the replacement of the four hydrogen atoms in $NH_4.OH$.

Amines are further distinguished as monoamines, diamines and triamines, according to the number of nitrogen atoms they contain.

The most general method of the production of primary amines consists in reducing the corresponding nitro compound with nascent hydrogen, and, as nitro compounds are much more readily obtained from closed chain than from open chain hydrocarbons, this method finds most frequent application in the preparation of the aromatic primary compounds. The following equation may serve as a typical example in which nitrobenzene is reduced by hydrochloric acid and iron filings (in the commercial way) to aniline:

$$\underset{\text{Nitrobenzene}}{C_6H_5NO_2} + 3H_2 = \underset{\text{Aniline}}{C_6H_5NH_2} + 2H_2O$$

The chief diamines of the benzene series which are used in the manufacture of dyestuffs are metaphenylenediamene, metatoluylenediamene and paraphenylenediamene. The metadiamenes are used chiefly as components in the preparation of azo dyes and Bismarck Brown, while the para derivative is used as a diazo (or tetrazo) compound.

Both metaphenylene and metatoluylenediamene are obtained by the reduction of the corresponding dinitrocompounds with iron and a little hydrochloric acid. Nitrous acid converts them into Bismarck Brown, although by acting on metaphenylenediamine with nitrous acid, which is added to it suddenly, nitrosometaphenylenediamine is formed as well as Bismarck Brown.

A most important class of diamines is that belonging to the diphenyl series, for a large number of these when tetrazotized and coupled with suitable components yield dyestuffs capable of dyeing unmordanted cotton direct. This property is indeed not confined to the diphenyl derivatives, but is possessed by paraphenylenediamine itself and by diamines of the diphenylamine series and others. The simplest member of this group is p-p-diamidodiphenyl or benzedine. This is prepared by the alkaline reduction (by means of zinc and caustic soda) of nitrobenzene by which hydrazobenzene ($C_6H_5NH—NH.C_6H_5$) is obtained, and then by dissolving this in hot hydrochloric a remarkable molecular change takes place, whereby benzedene is produced. This reduction may also be brought about electrolytically.

By subjecting ortho nitrotoluene to the same process (alkaline or electric), hydrazotoluene is produced, which is, in like manner, by the action of acids, transformed into p-p-diamidoditolyl or tolidine. This base gives azo-coloring matters very similar in dyeing properties to benzidine.

Other Bases Obtained

Other bases are diamisidine, obtained in an exactly similar way to tolidine, from ortho-nitroanisol. This base gives azo-dyes, which dye cotton a much bluer shade than the above bases. Dichlorobenzene, obtained by chlorination and subsequent saponification of diacetylbenzidene, and also by the above-described process, from orthonitrochlorobenzene.

The only example of an unsymmetrical base which is used on a large scale is ethoxybenzidine, which is obtained like this: Phenol is sulphonated to the para-sulphonic acid and then combined with diazo-benzene; this product is then ethylated, yielding benzeneazo phenetol sulphonic acid. This by alkaline reduction yields the hydrazo-compound, and, with acids, ethoxy benzidine mono sulphonic acid, which, on heating with water to 170 deg. Cent., yields ethoxybenzidine.

The property possessed by the aromatic amines of giving diazo-chlorides when their hydrochlorides are treated with nitrous acid causes them to be of considerable importance in the dyeing industry, not only because of the fact that these diazo-chlorides are the bases of the azo dyes, but also because from them a number of important derivatives of the hydrocarbons can be formed.

The diazo-chlorides are prepared by the action of nitrous acid (nitrite of soda) on the hydrochloride of the amine in the cold.

The amido compounds may be converted into nitro compounds on nitration or into sulphonic compounds on sulphonation. Thus, aniline ($C_6H_5NH_2$) on nitration as acetanilide ($C_6H_5NH.COCH_3$) yields ortho and para nitracetanilide, which give the corresponding nitranilines on hydrolysis.

By nitrating benzylideneaniline ($C_6H_5N.CHC_6H_5$) the para derivative is almost exclusively formed. Metanitraniline is produced from metadinitrobenzene by reduction with a mixture of sodium sulphide and sulphur.

The most important sulphonic acid of aniline is the para compound ($NH_2.SO_3H$), and this is prepared by the direct treatment of aniline with sulphonic acid, or, better, by the action of heat on aniline sulphite.

Sulphonilic Acid

p-Sulphonilic acid is prepared from 100 parts aniline and 110 parts concentrated sulphuric acid. The aniline is stirred into the acid and the acid sulphate thus obtained is heated in an oven until the temperature reaches 205 deg. Cent. This must take four hours. The oven is kept at this temperature for six hours more. The product is now broken up and dissolved in hot water with the addition of 40 parts of caustic soda (an alkaline reaction must be obtained). The solution of sodium sulphanilate is boiled for a few minutes with a little animal charcoal and filtered hot. On acidifying with hydrochloric acid, the sulphonilic acid crystallizes out; after standing overnight it is filtered at the pump and dried at 100 deg. Cent. The yield should be about 150 parts. Sulphonilic acid crystallizes from water in large colorless plates. Sulphonilic acid is used largely in the preparation of azo dyes. By the action of methyl alcohol and hydrochloric acid on aniline the important dimethylaniline $C_6H_5N(CH_3)_2$ is produced, which on treatment with nitrous acid is converted into para-nitrosodimethylaniline, which is largely used in the preparation of dyestuffs.

The considerable importance which has recently been acquired by those sulphur colors which are prepared from diphenylamine and its derivatives cause this substance to be of great technical interest. Diphenylamine is prepared by heating aniline with aniline hydrochloride under pressure, and derivatives of it may be prepared by heating together any nitrocompound containing a halogen atom in the ortho position to the nitro group with a primary amine in the presence of sodium acetate.

Developing

While most of the azo substantive dyestuffs are dyed and finished from a direct bath, their fastness to washing and soaping may be considerably improved by diazotizing and developing, but this method applies only to those substantive dyes that contain a diazotizable amido group, such as Diazo Orange, Diazo and Diazogen Reds, Diaminogene Blue, etc. The cotton is dyed in the usual manner and well rinsed and then diazotized cold as follows: For 100 pounds cotton add to the bath 2½ pounds nitrite of soda dissolved in cold water, stir and add 7½ pounds hydrochloric acid 32 deg. Tw. or 5 pounds sulphuric acid 168 deg. Tw. If the bath is used for diazotizing further lots, only one-third of the above quantities should be added for every fresh lot of goods.

The diazotizing is usually complete in about ten to fifteen minutes. After the goods are allowed to drain they should be immediately rinsed in a cold bath containing about 1 pint of hydrochloric acid per 100 gallons of water. The material is now, without delay, transferred to the cold developing bath, in which it is treated for a short time. Rinsing and, if necessary, soaping follow. There are various developers used according to the dyestuff used, but for azo colors of the benzene series beta naphthol is mostly employed. Very good results are obtained by diazotizing and developing with more than one developer. Thus beta-naphthol may be used together with resorcine or with toluylene diamine, or resorcine may be used with phenylene diamine or toluylene diamine.

The following direct colors (azo), after being applied to cotton, may be submitted to the above treatment, the colors produced being chiefly blue, brown and black:

Blue—Diazurine, Diazo Blue, Diamine Blue, Diaminogene.

Red—Rosanthrene.

Brown—Diazo Brown, Diamine Cutch, Diamine Brown, Cotton Brown.

Gray and Black—Benzo Blue, Diazo Blue Black, Diazo Black, Diamine Black, Diazo Brilliant Black.

The direct azo colors possess the remarkable property of precipitating the basic colors from their aqueous solution. Use is frequently made of this property for "topping" cottons dyed with the direct colors, either with a view to obtain compound shades or to brighten the color. Thus, by dyeing cotton first yellow in Chrysomine and then dyeing it again in a cold bath of Methylene Blue, a brilliant shade of green results. If, on the other hand, a direct blue is topped with a Methylene Blue, its brilliance is greatly enhanced.

Insoluble Azo Colors

The insoluble azo colors are produced as insoluble colored precipitates by adding a solution of a diazo compound to an alkaline solution of a phenol, or to an acid solution of an amido compound. The necessary diazo compound is prepared by allowing a solution containing nitrous acid to act upon a solution of a primary aromatic amine. It is usually desirable to keep the solutions cool with ice, owing to the very unstable nature of the diazo compounds produced. The color obtained varies according to the particular diazo compound, as well as the amine or phenol employed, beta-naphthol being the most useful among the latter.

The same colored precipitates are produced upon the *cotton* fiber if the material is first impregnated with an alkaline solution of the phenol, then dried and passed into a cold solution of the diazo compound. The most important of these colors is Para-nitraniline Red. The

(*Continued on page* 413)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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TWENTY-FIRST RESEARCH COMMITTEE MEETING

The twenty-first meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held at the Engineers' Club, Boston, Mass., on May 17, 1924.

The following members were in attendance: L. A. Olney, W. D. Livermore, W. H. Cady, W. C. Durfee, A. E. Hirst, G. A. Moran, W. K. Robbins, W. D. Scott, W. R. Moorhouse, R. F. Culver, W. D. Appel and W. E. Hadley.

H. W. Leitch, of M. T. Stevens & Sons Company, Franklin, N. H., was appointed a member of the Research Committee.

The committee on light fastness, W. H. Cady, Chairman, reported progress and is in hopes to have a preliminary survey ready for the coming Year Book.

The matter of tentative fastness tests, which appeared in the 1923 Year Book, was gone into in detail and it was decided that these tests would need to be carefully edited in order to assure a uniform nomenclature for the different terms. It was decided that the specifications of the type of textile material to be used for standard tests should be designated by the Association.

W. E. HADLEY, Secretary.

TWENTY-THIRD COUNCIL MEETING

The Twenty-third Council Meeting of the American Association of Textile Chemists and Colorists was held on Saturday afternoon, May 17, 1924, at the Engineers' Club, Boston, Mass.

The following members were in attendance: L. A. Olney, W. D. Livermore, W. H. Cady, W. C. Durfee, A. E. Hirst, G. A. Moran, W. K. Robbins, W. D. Scott, W. R. Moorhouse, R. F. Culver and W. E. Hadley.

The following were elected to membership in the Association:

Active Members

Adams, Carleton C., Garnerville Inn, Garnerville, N. Y. Chemist, Rockland Finishing Company, West Haverstraw, N. Y.

Benkert, Arthur L., 9 Montague Terracé, Brooklyn, N. Y. General sales manager, Peerless Color Company and Noil Chemical & Color Works, 152 West 108th Street, New York City.

Carey, John H., Box 52, Anderson, S. C. Chemist, Brogon Mills.

Donaldson, William N., 260 Oakdale Avenue, Pawtucket, R. I. Dyer, American Silk Spinning Company, Providence, R. I.

Dubois, G. H., Box 367, Fort Payne, Ala. Boss dyer, W. B. Davis & Son.

Eichlin, A. S., 1156 Fifteenth Street, Washington, D. C. Textile chemist, Bureau of Standards.

Goldman, Moses, 320 Linden Avenue, Brooklyn, N. Y. Dyer, Artistic Dyeing Company.

Guertin, Romuald J., J and Venango Streets, Philadelphia, Pa. Superintendent, Boger & Crawford

Holst, William A., Jr., 64 East Avenue, Long Island City, N. Y. Dye chemist, National Aniline & Chemical Company, New York City.

Hubbard, Clarence C., Bureau of Standards, Washington, D. C. Industrial fellow, National Association of Dyers and Cleaners.

Lagazio, Julius, 56 University Place, New York City. Colorist, J. G. Rutherford & Co.

Luck, George F., Loudon, Tenn. Superintendent, Loudon Hosiery Mills.

Mackenzie, Kenneth, 401 South Boylan Avenue, Raleigh, N. C. Instructor of chemistry and dyeing, North Carolina State College of Agriculture and Engineering.

Robertson, J. C., 59½ Chatham Street, Providence, R. I. Boss dyer, K. M. Gilmore & Co., Somerville, Mass.

Roche, Raymond V., 351 Abbott Road, Buffalo, N. Y. Laboratory supervisor, National Aniline & Chemical Company.

Rosenberg, Isidor, 458 Saratoga Avenue, Brooklyn, N. Y. Boss dyer, Artistic Dyeing Company.

Schenke, Edward M., Bureau of Standards, Washington, D. C. Research fellow, National Association of Hosiery and Underwear Manufacturers.

Shields, Walter D., Box 54, Durham, N. C. Superintendent of dyeing and finishing, Durham Hosiery Mills.

Smith, J. Baynard, Standard-Coosa-Thatcher Company, Chattanooga, Tenn. Assistant superintendent.

Swan, F. William, 2925 Sommer Place, Bronx, N. Y. Chemist and colorist, United Chemical Products Corporation, Jersey City, N. J.

Tapley, Fred J., 11 Sixteenth Avenue, Haverhill, Mass. Overseer of dyeing and printing, Osgood Mills, North Andover, Mass.

Weber, Edward, 297 Colvin Avenue, Buffalo, N. Y. Manager, National Aniline & Chemical Company.

Zisman, L. S., Gotham Silk Hosiery Company, 401 East Thirty-third Street, New York City. Boss dyer.

Junior Membership

Cameron, Norman J., 24 Pearl Street, North Dighton, Mass. Student, Bradford-Durfee Textile School.

Davis, Mark L., 87 Phillips Street, Methuen, Mass. Laboratory assistant, Pacific Print Works, South Lawrence, Mass.

Finkel, Louis, 2516 South Eighth Street, Philadelphia, Pa. Dyer, Royal Silk Dyeing Company.

Mason, Philip E., 4 Gellineau Street, Malden, Mass. Student, Lowell Textile School.

McCulloch, Hector A., 381 Weeden Street, Pawtucket, R. I. Dyer-second hand, Home Bleach & Dye Works.

Pooler, L. L., 121 Mount Washington Street, Lowell, Mass. Student, Lowell Textile School.

Stolz, William H., 429 Schuylkill Avenue, Reading, Pa. Student, Philadelphia Textile School.

Del Plaine, Parker H., 14 Mount Washington Street, Lowell, Mass. Student, Lowell Textile School.

W. E. HADLEY, Secretary.

APPLICATIONS FOR MEMBERSHIP

Junior Membership

Costello, John L., salesman and demonstrator, John Campbell Company, 2433 North Orianna Street, Philadelphia, Pa. Sponsors: George Lommel and Joseph F. Beck.

Purnell, William E., second hand, dyehouse, Cranston Worsted Mills, Bristol, R. I. Sponsors: E. P. Mathewson and J. E. Graham.

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Goldthwait, Charles F., care of J. L. Thatcher, Dudley, Mass.
Martin, John J., care of John Campbell & Co., 107 Broadway, Providence, R. I.
Otto T. Poetzsch, 32 Kent Court, Passaic, N. J.

OUTING OF NORTHERN NEW ENGLAND SECTION

The annual outing of the Northern New England Section of the A. A. T. C. C. will be held Thursday, July 10, 1924, at the Merrimack Valley Country Club, Methuen, Mass. Registration will start at 1.30 P. M., and dinner will be served at 6.30 P. M. (daylight saving time).

An afternoon and evening of "fun" are guaranteed by the entertainment committee, and several special features have been planned. An official announcement covering all details will be mailed to members of the Section on June 23rd.

Members from other Sections are extended a cordial invitation to join us in these festivities. Plan to attend by "ringing the calendar date" *now*, and help to make our "Second Annual" a memorable one.

ALBERT E. SAMPSON, Chairman.

Proceedings of the American Association of Textile Chemists and Colorists

QUESTIONNAIRE

All Members Please Note

The questionnaire reprinted below was mailed to all members of the Association by Secretary Hadley about six weeks ago. Up to the present time only slightly more than 50 per cent have been returned.

There is much material requested here which is essential to the publication of an accurate Year Book. There are also questions which, if answered, will be of assistance in making the next annual meeting a complete success.

It is earnestly requested that all members who have not already returned their questionnaires to Mr. Hadley will use the blanks given below and on the next page for the purpose of supplying the information desired. If you do not care to answer all the questions, at least send in your correct name, home address, and business connections.

The 1924 Year Book is now in process of going to press and your prompt response is essential. Do not blame anyone but yourself if errors in personal data appear in the Year Book because of your failure to send in a questionnaire.

1. Name .....

2. Home Address .....

3. Business Connection:
   a. Name of concern with which you are associated.....
   .....
   b. Address of concern.....
   c. Position occupied .....

4. Professional qualifications (i. e., textile chemist, dyer, etc.).....

5. Check the headings in which you are specially interested, cotton, wool, silk, linen, artificial silk, union material.

6. Please read the list of suggestions for which prizes are offered as published in the last Year Book and make suggestions for additional subjects.

7. What subjects can you suggest which you believe will be of general interest for presentation or discussion at our next Annual meeting. Will you present a paper in regard to one of these subjects, and if so, which one?

8. Give names of those whom you believe would be qualified to present a paper or speak in regard to the subjects you have mentioned.

9. Are there any special features in regard to the Annual Meeting you would suggest to make it of greater interest and value to the attending members?

10. Look over the 1923 Year Book and suggest any ways in which it might be made of more value to the readers.

11. Make any suggestions you may have in mind in regard to the general activities of the Association including the work of the Research Committee.

MAIL REPLIES TO WALTER E. HADLEY, 5 MOUNTAIN AVE., MAPLEWOOD, N. J.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

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TARIFF VIEWS MISINTERPRETED

A RECENT issue of the New York Journal of Commerce quoted from an address delivered by Prof. Louis A. Olney, of the Lowell Textile School, before the New England Association of Purchasing Agents, as follows:

"Of the 10 per cent of dyes we use which are not made in this country, a few we do not know how to make as yet, some we could make but for one reason or another the foreign manufacturer can make them much cheaper, and as long as we can get them abroad there is no particular reason for making them. . . .

"There are a few color effects and a few dyeings intended for some specific purpose that as yet are better produced by the use, in part at least, of imported dyes. Unless the American textile manufacturer secures these he is immediately threatened with a certain amount of competition from the foreign textile manufacturer who can readily secure them. Since these particular dyes are quite sure to come into the country on cloth, if not in kegs, until the American dye manufacturer is able to produce them they had far better come across the water in the latter form and give the domestic cloth manufacturer an opportunity to profit through their application."

The editorial then went on to say:

"Of course, this speaker has placed himself without the pale so far as not a few total exclusionists are concerned. But, after all, is there not a good deal of hard horse sense in what he says? And if he is right what is to be said of some of the provisions of the present dye tariff? Of course, it has not yet proved possible to make the existing law work anything like smoothly or effectively. It is therefore to be condemned on technical grounds, but if the speaker quoted above is approximately correct in his appraisal of the situation does not the law need major revision in other respects?"

Here is an example of contorting the remarks of an individual into an apparent meaning which was entirely foreign to the original speaker's intention. It is a vice common in legislative circles where portions of some expert's testimony are seized upon, elaborated and expanded in order to give color to arguments which, in many instances, are diametrically opposed to the line of thought expressed by the expert quoted.

Needless to say, Professor Olney intended no criticism of the present dye tariff. Unquestionably, it has certain weaknesses but, on the whole, it has functioned remarkably well for the purpose for which it was expressly intended—namely, the fostering and developing of a self-contained American dyestuff manufacturing industry.

COMMON SENSE FROM THE COTTON BELT

SPEAKING before the recent convention of the American Association of Cotton Manufacturers, held at Atlantic City, Norman H. Johnson, secretary of the Southern Wholesale Dry Goods Association, said in part:

"Another thing along those lines is that a few years ago we got hold of some very bad dyes in the South, and when those cotton goods made of good material faded, that had a great deal to do with women not taking chances on them.

"Gentlemen, let us put in the very best dyes that it is possible to put into cotton goods, and add it to the cost, and it will be every bit worth it. The return merchandise from bad colors is large, and while I am not holding any brief for the dye maker, we want utility and use, and if you can solve that problem by giving us colors that will hold and stand firm, and will stand poor soaps and all sorts of water, as must be done in the various sections, that in itself would be a great improvement in cotton goods."

This is the sort of talk which dyestuff manufacturers like to hear and it is the hardest sort of common sense. If all textile manufacturers would follow Mr. Johnson's advice, the oft-repeated anathemas which have been heaped upon American dyes would quickly be forgotten. There is no excuse to-day for any manufacturer turning out goods which are unsatisfactory from the standpoint of durability of color, except that he is endeavoring to cheapen his product by the use of inferior colors when better ones are available.

Let us hope that messages of this sort will increase in frequency and will be heeded by the textile manufacturers to whom they are directed.

"RAYON"

AS we go to press it is reported that the Board of Managers of the Silk Association of America has approved by a majority vote the substitution of the name "Rayon" for the term "Artificial Silk."

This action may be agreeable to a majority of the real silk manufacturers of the country, but we doubt very much if it will be acceptable to the textile and dry goods industries as a whole.

As a matter of fact, this entire agitation regarding the use of the term "Artificial Silk" seems to us to be something with which only a limited number of persons is seriously concerned, and with which there is little sym-

pathy throughout textile manufacturing and consuming fields as a whole. It is claimed that the use of the term "Artificial Silk" works a hardship upon the real silk manufacturers in that it implies to the public that the product is something other than it actually is and is an infringement of the rights inherent in the word "silk." We cannot see the logic in this claim. The word "artificial" by its very meaning implies that the product is an imitation—something not the same as the real article. The term may be cumbersome but it has come into such general use that it would seem to be a waste of energy to endeavor to educate the public to the general use of some other designation.

T. C.'S COLUMN

WHY THE GAP BETWEEN CHEMISTS AND DYERS?—THE DYER

SUPPOSE you are a dyer in a successful plant and the management has decided to hire a chemist, what is your first thought? "We are getting along all right, we do not need a chemist," or "That's fine, now we can get dyes tested on time and a few of the experiments made that I have had in mind for a year or two."

Whatever the point of view, the very first evidence that a chemist can be of assistance in a new place is the fact that so many mills are already spending money in this way and some of them have done so for years. There must be some reason for it, and the reason must be that the chemist has done them some good. *Point number one:* The chemist is worth a trial.

Our purpose now, in fact, is to show that the dyer has nothing to lose and much to gain by working with a chemist, who, of course, has to be of the right type, too.

As a dyer I would insist that an inexperienced chemist come into my department and learn something about it; I would want to satisfy myself as to his ability and cooperativeness. It should be a simple matter to do this by getting him to make some tests or experiments, insisting that he make them my way first. If necessary I would have him come out in the plant and watch the experimental work through the various stages to see that temperatures and other conditions were correct. I could soon tell whether he could work with me or whether he already "knows it all."

To some this will be a revolutionary idea, if not outright heresy, but isn't it common sense? If left to his own devices the chemist will no doubt do the best he can, but without a little practical knowledge there is nothing to prevent his going to the management with plausible but impractical schemes which in the end would only cause unpleasant explanations of why they wouldn't work, and misunderstanding in general.

One method of treating such cases has been to let the newcomer go ahead and make a mess of something, but it is, with few exceptions, an unfair and shortsighted policy to allow anyone to run an experiment that you know will fail, without attempting to show the error. If you are approached with any proposed experiment that may affect any part of the dyehouse production it is perfectly fair, and more sensible to insist on knowing what sort of tests it is based on, so that you can be sure that essential factors have not been overlooked.

The experienced chemist will know more about some things than the dyer and can be of corresponding aid, while even the inexperienced should from his somewhat different point of view soon acquire the ability to make good suggestions.

The chemist may have to be persistent, for if he is any good he will not always accept the first failure of an experiment as final. He has more time to think and to work on some problems than the dyer, and consequently can do many good and useful things that would not otherwise get done. If the dyer understands these relations and possibilities he can get a great deal of good from chemical laboratory service.

Frequently a stumbling block in the way of harmony is a feeling of jealousy, often quite unconscious, or a fear of losing credit for what is done. It is even hinted sometimes that a dyer is afraid of losing his job, but this sounds foolish, for there is no great chance of a young chemist overcoming a good dyer's head start. On the other hand, if a chemist does wish to become a dyer, a perfectly laudable ambition, he can find much better means of approach than trying to undermine someone else.

As to the credit for economies and new ideas, it should naturally go to the individual who is responsible, but if the dyer fears the loss of prestige he has only to reflect that the credit for the dyeing will certainly go to the dyer, and the management is not nearly as concerned about who thinks of an idea as about who uses it to the firm's profit.

Any outstanding achievement by a chemist deserves treatment as a special case. Wherever the more routine work has helped the dyer it is only fair to admit that certain things have been done by the aid of the laboratory that would probably not have been done without.

On the dyer's part an inclination to accept help from any new source is evidence of being awake and of working for the interest of the firm. It may not bring a raise of pay but it will establish a better standing with the management. Let the dyer then recognize that the chemist should be a source of help, if necessary show him how to be of most assistance, and above all give him a fair show. Then it is up to *him*.

T. C.

Canada's trade with Germany almost doubled in the fiscal year ended March, 1924. During that period imports from Germany of aniline and coal tar dyes totaled 603,317 pounds, valued at $431,366, an increase of 398,323 pounds and $126,636. There were also important increases in the imports of muriate of crude potash.

METZ RETURNS FROM EUROPE

Colonel Herman A. Metz returned from a brief trip to Germany and other European points on June 6. He reported that conditions in Germany were being somewhat benefited by the stabilization of the mark and the likelihood of adoption of the Dawes report, but emphasized that the only hope of restoring anything like normal conditions was the granting of extensive credits to the Central European nations, particularly Germany.

In regard to dyestuff matters, Colonel Metz reported that labor difficulties have been at least temporarily adjusted and that most of the dyestuff plants are running on something like a normal basis. He pointed out, however, that it was impossible for German or any other manufacturers to carry on a profitable export business so long as the flood of Reparations dyes continues to reach foreign markets. These dyestuffs are delivered to allied countries at no cost to them and are theoretically supposed to be paid for by the German Government. The latter, however, has lacked the funds to meet these payments and the net results is that the dyestuff manufacturers deliver without compensation. The dyes so delivered are intended to be used for the domestic consumption of the countries receiving them, but, being more than sufficient for domestic requirements, are offered freely, particularly by Italy, throughout the markets of the world at the best prices they will bring. It is, therefore, quite obvious that the manufacturers themselves cannot compete with these Reparations colors.

When asked about the present status of the proposed British Dyestuffs-I. G. agreement, Colonel Metz said he understood that this matter had been dropped for the time being; that some working arrangement might be effected at a later date but that there was no likelihood of its immediate consummation.

In response to a question as to the possibility of German manufacturing interests buying or building plants for dyestuff manufacture in America, Colonel Metz stated that he did not believe there was any probability of their doing so at the present time inasmuch as they were fully occupied with domestic difficulties.

Replying to a specific question as to the foundation for current rumors that his personal interest in the American manufacturing plants which he controls had been or was to be sold to some German concern or concerns, Colonel Metz asserted emphatically that there was no basis whatever for this report. He said that his plants would undertake the manufacture of certain products not previously produced by them, in which production he would have the benefit of the advice and co-operation of German companies with which he has long had business connections, but that the properties would continue to be, as in the past, entirely American concerns controlled by himself alone.

An interesting exhibit which Colonel Metz brought back with him consisted of various denominations of the stabilized paper currency, based on the gold value of the American dollar. The face of these certificates shows so many marks and fractions thereof equal to current American coinage: for instance, 1.05 marks equal one-quarter dollar; 4.20 marks equal one dollar, etc.

Recent Literature

TEXTILE FIBERS

"Textile Fibers," by J. Merritt Matthews, at one time head of the Chemical and Dyeing Department of the Philadelphia Textile School and author of many articles on textile chemistry, has recently been issued in a new enlarged fourth edition, fully illustrated, containing over one thousand pages and covering methodically and completely the subject of textiles, their chemical, physical and microscopical properties. The mill operator will find in this volume a surprising amount of just the sort of practical information that will contribute substantially to his stock of working knowledge, information that will give him a deeper insight into his own industry. The student of textiles will discover, in the same volume, a mine of scientific fact that comes only with the experience of a lifetime. The purely scientific phase has been skillfully combined with the practical in proportions of equal value. To the manufacturer in any of the numerous branches of textile production Dr. Matthews' book will be extremely useful as a reference work designed to solve those perplexing problems that arise in every mill, large or small. A clearer conception of the broad field covered by the book may be had by running down the titles of the twenty-eight chapters, which are arranged as follows:

General Classification; Asbestos as a Textile Fiber; Wool, Its Origin and Classification; Physical Structure and Properties of Wool; The Chemical Nature and Properties of Wool and Hair Fibers; Action of Chemical Agents on Wool; Reclaimed Wool and Shoddy; Hair Fibers; Silk, Its Origin and Cultivation; Physical Properties of Silk; Chemical Nature and Properties of Silk.

The Vegetable Fibers; Cotton; The Physical Structure and Properties of Cotton; Constituents of Raw Cotton; Cellulose and Its Chemical Properties; Chemical Properties of Cotton; Chemical Treatment of Fabrics for Water-proofing and Flame-proofing; Mercerized Cotton; The Minor Seed Hairs; Artificial Silks; Linen; Jute, Ramie and Hemp; Minor Vegetable Fibers and Paper Fibers.

General Analysis of the Textile Fibers; Analysis of Textile Fabrics and Yarns; Testing of Textile Fabrics; Analysis of Fibers and Yarns in Fabrics.

Dyestuff Tables

A List of the Principal American-Made Colors with Their Properties and Fastness Characteristics

[NOTE: The publishers of The REPORTER have secured more or less complete data in regard to many of the dyestuffs which are at the present time being manufactured in the United States. As the following material has been brought togetner from various sources, they realize that errors are quite likely to appear, and it is earnestly requested that any readers who find errors or who are able to give additional information will communicate with the publishers in order that this material may be made as correct, complete and up to date as possible. These tables will appear serially until all colors upon which we have data shall have been covered. The publication of this data was begun in the issue of March 10, 1924.]

AZO YELLOW
(Schultz No. 141)

COMPOSITION: Mono azo.

SPECIALLY SUITABLE FOR: Wool and silk, especially spun silk.

USUAL METHOD OF DYEING: Wool: Dyed with Glauber salt and sulphuric. Silk: Dyed in a very slightly acid bath of boiled-off liquor; too much acid makes the shade lighter.

SHADE: Clear golden yellow.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Soluble with difficulty.

LEVEL: Dyes level enough for piece dyes.

EXHAUSTS: Does not exhaust well.

FASTNESS TO:
- **Acid:** Fast to acetic acid.
- **Alkali:** Fairly good against ammonia and soda.
- **Carbonizing:** Fast.
- **Fulling:** Bleeds onto white cotton and white wool.
- **Light:** Not fast; changes shade after a few days' exposure.
- **Perspiration:** Not fast to perspiration.
- **Potting:** Not fast.
- **Rubbing:** Very fast, even in heavy shades.
- **Scouring:** Very moderate; bleeds badly.
- **Steaming:** Shade goes much duller.
- **Sulphur:** Fast to stoving; white wool is not stained.
- **Washing:** Very moderate; bleeds off badly.
- **Water:** Not fast.

SENSITIVE TO METALS, LIME: Sensitive to copper, the shade becoming greener. Sensitive to iron; the shade goes duller and red.

OTHER PROPERTIES: Dyes wool in a neutral bath. Cotton and artificial silk effect threads are not stained in an acid bath.

DYED BY OTHER METHODS: Dyed on silk, the fastness to washing is improved by after-treating with tannin.

ON UNIONS: Cotton-wool unions dyed acid: the cotton remains white. Cotton-wool unions dyed neutral: the cotton is somewhat stained; the wool is dyed well.

ON OTHER MATERIALS: Cotton-silk unions dyed in a phosphate of soda and soap bath: the silk is dyed a heavy shade, while the cotton remains nearly white. Silk: Dyed in a boiled-off liquor bath slightly acidified, gives a golden yellow shade faster to water than on the wool. Wool-silk unions: The wool is dyed somewhat redder and deeper than the silk.

DISCHARGING: The shade on wool does not discharge well with tin crystals, but gives a moderately good discharge with zinc dust.

COMPETING PRODUCTS: Made in the United States by Central Dyestuff & Chemical Company; Dye Products & Chemical Company; Grasselli Chemical Company; National Aniline & Chemical Company; Textile Chemical Company; American Aniline Products, Inc.; Newport Chemical Works.

TROPAEOLINE
(Schultz No. 143)

COMPOSITION: Mono azo.

SPECIALLY SUITABLE FOR: Silk.

USUAL METHOD OF DYEING: Boiled-off liquor and sulphuric acid.

SHADE: Golden yellow.

SHADE BY GASLIGHT: No change in shade.

SOLUBILITY: Good solubility.

LEVEL: Dyes level.

EXHAUSTS: Fairly well.

FASTNESS TO:
- **Acid:** Fast.
- **Fulling:** Not fast.
- **Light:** Not fast; shade is changed after a few days' exposure.
- **Rubbing:** Fast.
- **Scouring:** Not fast.
- **Washing:** Not fast.
- **Water:** Not fast.

ON OTHER MATERIALS: Not recommended for wool or cotton.

PRINTING: Not adapted.

COMPETING PRODUCTS: Made in the United States by Heller & Merz Company and American Aniline Products, Inc.

ORANGE I
(Schultz No. 144)

COMPOSITION: Mono azo.

SPECIALLY SUITABLE FOR: Wool and silk.

USUAL METHOD OF DYEING: Acid with Glauber salt and sulphuric on wool. Boiled-off liquor and sulphuric on silk.

SHADE: Orange.

FASTNESS TO:

Acid: Very sensitive.
Alkali: Very sensitive.
Carbonizing: Not at all fast.
Fulling: Not at all fast; the color bleeds into white cotton and wool.
Light: Very moderate fastness.
Potting: Bleeds badly.
Rubbing: Crocks badly.
Scouring: Bleeds badly.
Steaming: Not fast.
Washing: Not fast; color bleeds.
Water: Not fast; color bleeds.

OTHER PROPERTIES: The color is not generally used for dyeing on account of its sensitiveness to acids and alkalies.

DYED BY OTHER METHODS: Its use is allowed in the coloring of foodstuffs.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc.; Central Dyestuff & Chemical Company; Commonwealth Color & Chemical Company.

ORANGE IV
(Schultz No. 139)

COMPOSITION: Mono azo.

SPECIALLY SUITABLE FOR: Wool and silk.

USUAL METHOD OF DYEING: Glauber salt and sulphuric.

SHADE: Very yellowish and fiery overhand.

SOLUBILITY: Good.

LEVEL: Good; can be added at the boil with care.

EXHAUSTS: Well.

FASTNESS TO:

Acid: Good fastness.
Carbonizing: Fairly fast.
Fulling: Very poor fastness; bleeds badly into whites.
Light: Not very fast; changes shade after fourteen days' exposure.
Potting: Not fast; bleeds.
Rubbing: Rubs very slightly.
Scouring: Very poor; bleeds badly; shade goes lighter.
Steaming: Fast to dry steaming.
Sulphur: Bleeds slightly after stoving.
Washing: Not fast; bleeds off badly.
Water: Not fast; bleeds in Markischer test.

OTHER PROPERTIES: Has excellent covering power; it is seldom used as a self-color.

ON UNIONS: Cotton-wool: Dyed acid, the cotton is tinted considerably. Wool-silk: Both fibers dyed about equally.

ON OTHER MATERIALS: Silk: Dyes in a bath of boil-off liquor broken with sulphuric. Not fast to water.

DISCHARGING: Discharges white with zinc dust.

COMPETING PRODUCTS: Made in the United States by Textile Chemical Company; American Aniline Products, Inc.

ORANGE II
(Schultz No. 145)

COMPOSITION: Mono azo.

SPECIALLY SUITABLE FOR: Wool.

USUAL METHOD OF DYEING: Glauber salt and sulphuric acid.

SHADE: Yellow shade orange..

SHADE BY GASLIGHT: No change in shade.

SOLUBILITY: Good.

LEVEL: Good; can be fed on at the boil with care. Not level in light percentage.

FASTNESS TO:

Acid: Fast.
Alkali: Fast.
Carbonizing: Fast.
Fulling: Not at all fast; bleeds into white wool and cotton.
Ironing: Fast.
Light: Moderate fastness; shows change in shade after fourteen days.
Perspiration: Fast.
Potting: Not fast.
Rubbing: Fast.
Scouring: Not fast; bleeds off.
Steaming: Fast.
Street Dirt: Fast.
Sulphur: Fairly fast; bleeds slightly after stoving.
Washing: Not fast; bleeds off.
Water: Markischer test: bleeds.

OTHER PROPERTIES: Cotton-effect threads are unstained in an acid bath. Used for staining silk throwsters' emulsions.

DYED BY OTHER METHODS: Can be top-chromed without changing shade; the properties, however, are not improved.

ON UNIONS: Dyes wool well in a neutral bath. Wool-silk unions dyed with sulphuric acid: both fibers are dyed equally. Dyed with acetic acid, the silk is very light.

ON OTHER MATERIALS: Silk: Dyes with boiled-off liquor broken with sulphuric acid. Cotton: Dyed with alum and Glauber salt; not fast to washing. Jute: Can be dyed with alum. Paper: Add to the unsized pulp; good for all kinds of sized pulp. Leather: Suitable; penetrates well on chrome-tanned leather.

PRINTING: Suitable for printing on wool.

DISCHARGING: Discharges white with tin crystals or zinc dust.

COMPETING PRODUCTS: Made in the United States by Amalgamated Dyestuff & Chemical Company; American Aniline Products, Inc.; Calco Chemical Company; Central Dyestuff Company; Cincinnati Chemical Works; Commonwealth Color & Chemical Company; E. I. du Pont de Nemours & Co.; Heller & Merz Company; National Aniline &

(*Continued on page* 414)

The Journal of a Hosiery Dyer

Lustron in Two Tones—Fuzz and Silk Lice—Boil-off and Soap Spots—Cotton and Art Silk Dyeing—Heathers in Triple Fiber-Tones

By S. P. R.

Lustron in Two Tones

JUNE 14.—Here comes a new one: they made a lot of half-hose with a twist of cotton and Lustron, which is sometimes called acetate silk, and asked for a line of two-tones. I had some inside information on how to work it, so it didn't give me much trouble. The goods have to be boiled for a few minutes, just to wet them out, in a little sulphonated oil, because the Lustron is full of mineral oil, but if they were boiled any time in soda it would spoil the results. When the oil is washed out you dye the Lustron any shade you want with a basic dye and a little acetic acid. The cotton stains some but by boiling it will clean up and all the dye goes on the Lustron. Then the cotton can be dyed as usual in a new bath, but you must use dyes that leave Lustron white. For instance, Direct Black E would give a yellow tint on Lustron, but Columbia Black FF would leave it white. The dye people gave me a big list of what I could use, but there isn't any need of putting it down here.

Fuzz and Silk Lice

June 30.—My helper was trying out a new shade on two pair of ladies' all-silk goods to-day and I let him go along in his own way just to see what kind of a job he would turn out. After the goods had been boiled and poled for four or five hours he showed me a dried sample that looked as if it had a white powder streaked over it. He thought that it might be Glauber salt drying out on it, but I had seen them before like that and, to show him what was going on, told him to boil them a couple of hours longer. The white fuzz had almost disappeared, but instead the silk was full of little pellets that we call "silk lice." That is the way silk breaks down when it is worked too much, and as soon as a dyer feels that he has had his goods in too long the lot ought to be either accepted as it is or redyed into black. The fuzz will show up on a dry black, but if a little oil finish is used it cannot be noticed. A dyer should always be given the right to stop a lot at the point of safety rather than struggle with a difficult match till the goods are spoiled.

Boil-Off and Soap Spots

July 5.—It seems as if our boil-off is right at last. When I first came here there was something wrong with the soap, so I fussed around till I got a good one that would wash out clean without leaving little cheesy spots in the goods. They were using silicate of soda with it and boiling two hours, and the goods felt like anything but silk. Ten to twelve per cent of a good soap and three per cent of soda with an hour's boil removes all the gum without injuring the silk. I have seen silk goods out of the boil-off that were "lousy" before they were dyed, just because the dyer had given them too much. If you don't get all the gum out it stays in patches and streaks that dye darker than the rest of the silk. Even with a good soap a hot rinsing is necessary and three waters are not too much. If any soap is left in the goods it is almost sure to show itself in spots later on. The soap we use now is a cocoanut-oil soap, and it works better with hard water than green olive soap.

Cotton and Art Silk Dyeing

July 8.—Mercerized cotton and art silk is a queer combination, and it is surprising how little real information the dyestuff houses can give that will help a dyer. Take almost any direct cotton dye and dye a sample half hose in a bath without salt; at 1 ounce of dye to the hundred pounds all the color goes on the cotton and none on the art silk. If salt is present, then the art silk takes up some color. Now, if you go ahead and increase the dye there is a point where both dye about the same depth, but when you come to a full deep shade the art silk takes almost all the color and leaves the cotton thin, even if there isn't a bit of salt in the bath. It's going to be a lot of work testing out all the dyes to learn how they act, for none of the dye dealers has gone into the subject.

There must be some dyes that will dye cotton heavier and some that dye art silk heavier. Fortunately, the medium shades made with good leveling direct dyes with a little sulphonated oil in the bath generally come out pretty goods.

Heathers in Triple Fiber-Tones

July 20.—We have been getting a lot of heathers or two-tones on half hose made of art and tram silk with mercerized tops, heels and toes. Whenever the cotton and art silk are to be black or blue I boil off and dye in one bath with Black BH, and then develop into black or blue as wanted. This leaves the silk a good white and I can cross-dye it with almost any acid dye at 160 deg. with a little acetic acid. Then there is a line of browns and tans that are easy to get with a mixture of

a yellow or orange that leaves silk white, some Benzo Fast Scarlet 4BS and Black BH dyed and boiled off at the same time. The silk is cross-dyed same as before. Then there is another good one I make with Trisulfon Brown B in the boil-off. This leaves the silk yellow, but when I add Patent Blue A I can get brown cotton and art silk and green silk in one operation. All these two tones need to be washed well because they seem to show more tendency to dry streaky after whizzing than ordinary solid shades.

Foreign Dyes Imported Through the Port of New York During May

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

1—The Six Leading German Companies

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.
B—Badische Anilin-und Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.
By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.
C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.
K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.
M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

2—The Seven Smaller German Companies

BK—Leipziger Anilinfabrik Beyer & Kegel, Furstenberg near Leipzig. Founded 1882.
GG—Chemikalienwerk Greishem G.m.b.H., Griesheim on the Main. Founded 1881.
CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.
GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.
L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.
tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—Dutch, Belgian and French Companies

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.
NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.
LG—Lazard Godchaux, of Brussels. (These products are probably compounded, largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4—Swiss Companies (all at Basel)

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.
G—Anilinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.
I—Geselfschaft fur chemische Industrie. Founded 1885. Branch in France.
S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

5—English Companies

BAC—The British Alizarin Co., Ltd. Established 1882.
ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester. Founded 1876.
CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.
CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.
RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1820. (Purchases by British Dyes, Ltd.)
BD—British Dyes, Ltd Founded 1915.
Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.
O—Importations of unknown source, through dealers in colors.
Lo—Charles Lowe & Co., Manchester.
Br—Brotherton & Co., Ltd., Mersey Chemical Works.

THE imports of coal-tar dyes for May, 1924, through the port of New York totaled 167,245 pounds, with an invoice value of $165,521. In addition, 15,834 pounds, valued at $12,032, were reported through the port of Boston.

Imports of Dyes Through the Port of New York, 1924

Month	Pounds	Value
January	288,743	$232,571
February	158,874	176,657
March	293,862	302,016
April	174,880	182,253
May	167,245	165,521

Five Leading Dyes, by Quantity, Imported

	Pounds
January—	
Indanthrene Blue RS	15,090
Helindone Pink R	11,500
Indanthrene Golden Orange R	10,791
Ciba Bordeaux B	9,792
Chlorantine Fast Brown	8,488
February—	
Algol Brown B	20,497
Erioglaucine	12,213
Indanthrene Golden Orange R	6,960
Algol Brown G	6,679
Phosphine	6,522
March—	
Fast Green	16,720
Algol Brown 3G	15,139
Indanthrene Golden Orange G	13,195
Indanthrene Golden Orange R	12,696
Indanthrene Blue GCD	9,666
April—	
Algol Brown R	18,702
Fast Green	7,059
Algol Blue 3G	5,804
Alizarine Blue Black	5,673
Palatine Black	5,000

May—

Indanthrene Blue BCS	10,030
Chlorantine Fast Blue 2GL	9,021
Cross Dye Green B	6,727
Indanthrene Golden Orange G	6,311
Polar Red G	5,441

DYES

Per Cent of Quantity by Countries of Shipment

	1924				
	Jan.	Feb.	March	April	May
Germany	41	44	63	49	32
Switzerland	32	35	15	23	32
Italy	6	8	6	13	11
Belgium	8	4	3	..	..
England	5	3	6	6	8
Holland	..	..	4	3	5
Canada	3	1	..	..	..
France	3	2	2	5	8
All others	2	3	1	1	1

Imports of Medicinals, Intermediates, Photographic Developers and Other Coal-Tar Chemicals

The poundages given are approximate, because a small quantity of the medicinals were reported in ampoules, the exact weight of which is not known:

Month	Pounds	Value
January	201,271	$48,116
February	55,094	16,870
March	212,343	46,254
April	21,550	22,789
May	17,534	7,001

Imports of Color Lakes

Month	Pounds	Value
January	(none)	(none)
February	4,181	$1,848
March	11,520	3,343
April	2,956	2,143
May	3,421	1,034

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schultz number the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

The designation of "†" for competitive and "*" for non-competitive indicates the appraisement basis for the assessment of the ad valorem duty in Paragraph 28 of the Tariff Act of 1922. Those dyes without designation are doubtful, pending further investigation.

The ad valorem rate for competitive dyes is based on the American selling price as defined in Subdivision (f) of Section 402 of Title IV; the ad valorem rate for non-competitive dyes is based on the United States value as defined in Subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922.

Dyes of Coal-Tar Origin

Schult: No.	Name of Dye and Manufacturer	Quantity (pounds)
28	Hansa Yellow G	750
	Hansa Yellow G Powder—(M)	
124	Janus Green B—(M)	50
183	†Eriochrome Black T—(G)	100
207	Diphenyl Fast Brown GNC—(G)	2,205
220	Palatine Black	3,000
	Wool Black GRF—(A)	
274	Diaminogene	500
	Black Extra—(C)	
339	Brilliant Orange G	3,000
	Diamine Orange B—(C)	
343	Diamine Fast Red	88
	Diamine Fast Red 8BL—(C)	
354	Direct Gray R	1,907
	Direct Gray R Paste—(G)	
366	Delta Purpurine 5B—(By)	441
373	Congo Orange R—(A)	500
392	Toluylene Orange	1,763
	Pyrazol Orange G Conc.—(S)	
	Toluylene Fast Orange GL—(By)	
418	Diamine Brilliant Blue G—(C)	50
448	Diamine Bronze G—(C)	50
449	Trisulphon Brown B	1,597
	Trisulphon Brown B Conc.—(S)	
456	Benzo Fast Blue	330
	Benzo Fast Blue 4GL—(By)	
457	Trisulphon Brown GG	4,518
	*Trisulphon Brown GG Conc.—(S)	
493	Auramine	1,000
	†Auramine N Conc.—(S)	
501	*Brilliant Glacier Blue—(I)	220
505	Light Green (Yellowish)	220
	†Acid Green GG Extra—(By)	
508	Xylene Blue AS	7,000
	Xylene Blue AS Conc.—(S)	
516	Crystal Violet	222
	Crystal Violet Extra Powder—(B)	
521	Aniline Blue	50
	Opal Blue, Blue Shade—(M)	
530	Acid Violet	100
	Acid Violet 4 BLO—(M)	
541	Brilliant Dianil Blue 6G—(M)	100
543	Patent Blue	1,520
	Neptune Blue BGX Conc.—(B)	
	Patent Blue V—(Q)	
545	Patent Blue A	1,820
	†Brilliant Acid Blue A—(By)	
	Patent Blue A—(M)	
546	Cyanol	550
	Cyanol Extra—(C)	
555	Aurine—(Lo)	560

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
559	Victoria Blue	1,192
	Victoria Pure Blue BO—(B)	
568	Pyronine G—(Q)	5
571	Rhodamine 6G	774
	Rhodamine 6G Extra—(B)	
	Rhodamine 6GDN Extra—(B)	
	Rhodamine 6GDN Extra—(By)	
573	Rhodamine B	2,305
	†Rhodamine B Extra—(I)	
	†Rosazeine B Extra—(M)	
601	Coerulein S	149
	Coerulein S Powder—(B)	
606	Phosphine	4,000
	Phosphine 3R—(A)	
608	Euchrysine	666
	†Patent Phosphine GRNTN—(B)	
613	Quinoline Yellow	2,149
	Quinoline Yellow Conc.—(S)	
617	Columbia Yellow	331
	Diphenylchlorine Yellow FF Supra—(G)	
618	Thioflavine T	150
	Methylene Yellow H—(M)	
621	Cresyl Blue BBS	5
	Brilliant Cresyl Blue BB—(Q)	
658	Fast Black	254
	Gallophenine D—(By)	
681	New Fast Gray	880
	*Malta Gray J—(P)	
698	Nigrosine (spirit soluble)	5
	†Nigrosine Wax—(M)	
705	Indamine 6R	1,500
	Acid Cyanine BF—(A)	
	Idocyanine B—(A)	
724	Immedial Black	500
	Immedial Direct Blue B—(C)	
746	Katigene Green	2,204
	Pyrogene Green GK—(I)	
759	Anthraflavone G	1,986
	*Anthraflavone GC Powder—(B)	
	Anthra Yellow GC Paste—(B)	
760	Indan. Gldn. Orange G (sgle. stngth.)	6,311
	*Duranthrene Golden Orange Y Paste—(BD)	
	Helindone Golden Orange IG Double Paste—(M)	
	Vat Golden Orange G Paste—(B)	
	Vat Golden Orange G Dbl. Pst.—(B)	
	Vat Golden Orange G Powder—(B)	
761	Indan. Gldn. Orange R (sgle. stngth.)	2,728
	Vat Golden Orange RRT Paste—(B)	
	Vat Golden Orange RRT Pdr.—(B)	
	Vat Orange RRT Paste—(B)	
762	Indan. Scarlet GS Powder—(B)	55
763	Indan. Dark Blue BO	524
	Indan. Dark Blue BO Paste—(B)	
765	Indan. Green B (sgle. stngth.)	3,000
	Helindone Black IBB Dbl. Pst.—(M)	
767	Indan. Violet RR (sgle. stngth.)	1,296
	Indan. Brilliant Violet RR Pdr.—(B)	
778	Alizarine Synthetic	2,595
	Alizarine Red 2AB Paste—(Q)	
	Alizarine VI Extra Pure—(B)	
780	Alizarine Red	275
	Alizarine Red S Powder—(B)	
784	Alizarine SX, GD	2,204
	Alizarine SX 20% Paste—(B)	
785	Alizarine RGGI	1,941
	Alizarine Red SDG Paste—(M)	
	†Alizarine Red XGP Paste—(By)	
792	Cibanone Orange R (sgle. stngth.)	3,306
	*Cibanone Orange R Powder—(I)	
794	Cibanone Black	1,102
	Cibanone Black B Paste—(I)	
795	Cibanone Yellow R	715
	Cibanone Yellow R Powder—(I)	
804	Alizarine Blue S	330
	Alizarine Blue S Powder—(By)	
816	Algol Red 5G (sgle. stngth.)	864
	Vat Red 5G Powder—(By)	
819	Algol Red FF, R (sgle. stngth.)	2,473
	*Algol Red FF Extra Paste—(By)	
	*Algol Red R Extra Paste—(By)	
	Algol Red R Extra Powder—(By)	
820	Algol Brilliant Violet R	100
	*Duranthrene Brilliant Violet Paste—BD	
821	Algol Brilliant Violet 2B (sgle. stngth.)	1,240
	*Algol Brilliant Violet 2B Pdr.—(By)	
	Vat Brilliant Violet BBK Pdr.—(By)	
822	Algol Brilliant Orange FR (sgle. stngth.)	1,495
	Vat Orange RRK Paste—(B)	
	Vat Orange RRK Powder—(B)	
	Vat Orange RRK Powder—(By)	
828	Indan. Claret B (sgle. stngth.)	760
	*Indan. Bordeaux B Powder—(B)	
830	Indan. Red R (sgle. stngth.)	1,606
	Anthra Red RT Paste—(B)	
	Vat Red R Extra Powder—(B)	
831	Indanthrene Red BN	2,369
	*Duranthrene Red BN Paste—(BD)	
	Helindone Red DIBN Ex. Paste—(M)	
	Vat Red RK Paste—(B)	
	Vat Red BN Extra Paste—(B)	
832	Indanthrene Violet RN	279
	Vat Violet BN Paste—(B)	
833	Algol Olive R (sgle. stngth.)	2,640
	*Algol Olive R Powder—(By)	
	Vat Olive R Powder—(By)	
838	Indanthrene Blue RS	872
	†Indanthrene Blue RS Paste—(B)	
840	Indanthrene Blue 3G (sgle. stngth.)	1,980
	*Indanthrene Blue 3G Powder—(B)	

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
844	Algol Blue 3G (sgle. stngth.)	1,160
	Vat Blue 5G Powder—(By)	
847	Algol Green B	604
	† Green BB Paste—(By)	
849	Indanthrene Yellow Single Paste	3,692
	Indanthrene Yellow G Dbl. Paste—(B)	
	†Vat Yellow G Dbl. Pst. Fine—(B)	
851	*Alizarine Direct Blue—(M)	80
855	Alizarine Pure Blue	1,321
	*Alizarine Sky Blue B Powder—(By)	
856	Alizarine Astrol	1,603
	*Alizarine Astrol B Powder—(By)	
	*Alizarine Blue AS Powder—(By)	
858	Alizarine Saphirol B	2,306
	†Alizarine Light Blue B Conc.—(S)	
	Alizarine Saphirol WS—(By)	
862	Alizarine Blue Black	3,763
	†Alizarine Blue Black B Powder—(By)	
	Alizarine Blue Black 3B Pdr.—(By)	
864	*Anthraquinone Green GXNO—(B)	247
865	Alizarine Direct Green G	620
	Alizarine Cyanine Green G Ex.—(By)	
	*Aliz. Cyanine Green 3G Pdr.—(By)	
868	Cibanone Brown B Paste—(I)	110
870	Algol Corinth R (sgle. stngth.)	2,517
	Algol Corinth R Powder—(By)	
	Vat Corinth RK Paste—(By)	
	Vat Corinth RK Powder—(By)	
874	Indigo, Synthetic—(M)	529
876	Indigo, White	110
	*Indigosol DH—(DH)	
883	Indigo KG (sgle. stngth.)	500
	Indigo 6B Powder—(M)	
904	*Helindone Brown G Paste—(M)	110
907	Ciba Scarlet	1,472
	Helindone Fast Scarlet C Paste—(M)	500
	Thio Indigo Scarlet 2G Paste—(K)	765
908	Ciba Red R Paste—(I)	2,425
910	Helindone Pink	500
	Helindone Pink BN Paste—(M)	
912	Thio Indigo Red B (sgle. stngth.)	1,542
	*Ciba Pink BG Paste—(I)	
	Ciba Pink BG Powder—(I)	
913	*Thio Indigo Orange R Paste—(K)	528
918	Helindone Red 3B	1,551
	Helindone Red 3B Paste—(M)	
	*Thio Indigo Red 3B Paste—(K)	975
923	Ursol	....
	Fur Blue Black A, SB—(A)	
	Fur Brown NZ, P, 4R, SK, SKG—(A)	
	Fur Gray B, ALA—(A)	
	*Fur Yellow 4G—(A)	

(This table includes imports through the port of New York to the amount of 167,245 pounds, and also 15,834 pounds from Boston. Included in this list are several entries made during the early part of 1924.)

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Alizarine Rubinol	1,323
*Alizarine Rubinol GW Powder—(By)	
*Alizarine Rubinol R Powder—(By)	
Anthracyanine 3FL—(By)	100
*Brilliant Milling Blue B—(C)	200
Brilliant Milling Red R—(C)	500
Cashmere Blue TG Extra—(By)	100
†Cloth Fast Yellow G—(I)	220
Fast Acid Green BB Extra—(Gr-E)	500
Guinea Light Blue SE—(A)	200
Onis (Anthosine) 3B—(B)	278
Polar Red G Conc.—(G)	5,441
*Scarlet 2R—(S)	500
Wool Fast Blue BL—(B)	333
*Xylene Milling Red B Conc.—(S)	500

Vat Dyes

*Algol Brilliant Pink FB Paste—(By)	443
Anthra Wool Black 3B 60%—(B)	100
Anthra Wool Black T 60%—(B)	100
Anthra Wool Brown CM 60%—(B)	25
Grelanon Yellow G Paste 10%—(Gr-E)	560
Helindone Black B in Grains 60%—(M)	25
Helindone Brown CM in Grains 60%—(M)	25
Helindone Brown C3R in Grains 60%—(M)	25
Helindone Fast Scarlet B Paste 10%—(M)	5
Helindone Green IGG Paste—(M)	200
Helindone Red BB in Grains 60%—(M)	25
Helindone Red CR in Grains 60%—(M)	25
Helindone Yellow CA 10%—(M)	25
Hydron Olive GN Paste 10%—(C)	200
Hydron Pink FF (sgle. stngth.)	1,749
Hydron Pink FF Paste—(C)	
†Hydron Pink FF Powder—(C)	
Hydron Scarlet 3B (sgle. stngth.)	660
Hydron Scarlet 3B Powder—(C)	
Indan. Blue BCS (sgle. stngth.)	10,030
Indanthrene Blue BCS Powder—(B)	
Indanthrene Brown	1,388
Indanthrene Brown R Paste—(B)	
Indanthrene Brown 3R Paste—(B)	
Vat Brown GG Paste—(By)	1,001
Vat Gray 3B (sgle. stngth.)	1,000
Vat Gray 3B Double Paste—(B)	
Vat Red Violet RRK (sgle. stngth.)	264
Vat Red Violet RRK Powder—(B)	

Mordant and Chrome Dyes

Acid Alizarine Gray G—(M)	220
Acid Alizarine Red G—(M)	50
*Alizarine Emeraldole Green G—(M)	10
Alizarine Fast Gray 2BL Powder—(By)	275
Brilliant Chrome Blue 2B—(DH)	110
Chrome Printing Red B—(DH)	110
*Chromorhodine 6GN Extra—(DH)	110

Name of Dye and Manufacturer	Quantity (pounds)
Eriochrome Green L—(G)	441
Metachrome Brilliant Blue BL—(A)	100
Metachrome Brown 6G—(A)	1,250
Metachrome Violet 2R—(A)	50
Pilatus (Palatine) Chrome Brilliant Violet B —(B)	100

Direct Dyes

Benzo Dark Brown Extra—(By)	551
Benzo Fast Black L—(By)	381
Benzo Fast Brown RL—(By)	705
Benzo Fast Heliotrope 4BL—(By)	110
Benzo Fast Scarlet 5BL—(By)	110
Benzo Rhodamine Red 3B—(By)	110
Brilliant Benzo Fast Yellow GL—(By)	55
Brilliant Benzo Violet 2R—(By)	220
Brilliant Congo Blue 5R—(A)	100
Brilliant Congo Violet R—(A)	100
Brilliant Sky Blue 8G Extra—(By)	441
Chlorantine Fast Blue 2GL—(I)	9,021
Chlorantine Fast Yellow RL—(I)	220
Dianil Light Red 12BL—(M)	100
Diazanil Pink B—(M)	220
Diazo Brilliant Green 3G—(B)	300
Diazo Fast Violet 3RL—(By)	24
*Diazo Fast Yellow 2G—(By)	99
Direct Brown 3GL—(By)	331
Fast Cotton Gray BL, GL—(A)	10
Fast Cotton Red 8BL—(A)	500
Naphthamine Yellow BNF—(K)	500
*Parasulphon Brown G—(S)	330
*Pyrazol Orange R Conc.—(S)	200
Rosanthrene Orange R—(I)	1,102
Zambesi Black V—(A)	1,000

Basic Dyes

*Brilliant Acridine Orange 5R—(DH)	220
Rosolane Extra Strong—(M)	5
Tannocyanine B—(M)	25

Sulphur Dyes

*Cross-Dye Green B 100%—(BD)	6,727
Cross-Dye Green 2G Conc. 100%—(BD)	2,304
Sulphur Brilliant Blue CLB—(A)	500
Sulphur Brown CLG—(A)	10
*Thionol Brown R—(BD)	4,240

Color Lake Dyes

Hansa Yellow 10G Powder—(M)	25
Stone (Lithol) Fast Orange R Powder—(B)	220

Unidentified, Unclassified Dyes

Blue IV, V—(BC Ltd.)	360
Brilliant Blue G—(By)	728
Developer Light Blue 4GLX—(By)	110
Golden Orange I—(BC Ltd.)	180
Golden Yellow VIII—(BC Ltd.)	180
Jamaica Brown—(Hou.)	2
Lilac Blue—(Sa)	25
Orange I—(BC Ltd.)	180
Pure Yellow I—(BC Ltd.)	200
Red I, III, V—(BC Ltd.)	540
Rose Color No. 563—(Sa)	25
Soap Green—(Hes)	32
Soap Yellow—(Hes)	21
Solamine II—(BC Ltd.)	90
Victoria Blue No. 594—(Sa)	10

Color Lakes of Coal-Tar Origin

Name of Lake	Quantity (pounds)
Alizarine Lake RLS	197
Alizarine Madder Lake VN	333
Blue 942	2,240
Brilliant Lake G Powder	551
Viridine Green	100

Synthetic Aromatic Chemicals of Coal-Tar Origin

Name of Chemical	Quantity (pounds)
†Acetophenone	55
*Acetyltoluene	7
†Amyl Salicylate	160
†Anisic Aldehyde	165
†Benzophenone	32
†Benzyl Acetate	180
†Benzyl Benzoate	82
†Cinnamic Aldehyde	50
†Coumarin	110
*Dimethylhydroquinone	20½
†Heliotropine	50
†Methylacetophenone	66
†Methyl Anthranilate	52

FALL SEASON COLOR CARD

The 1924 Fall Season Color Card recently issued by the Textile Color Card Association displays fifty-eight different shades and tints classified as Directoire colors, shoe and leather colors and woolen colors. A bulletin accompanying the card describes the most popular colors for midsummer millinery trade, and calls attention to the predominance of browns for general costume wear. This bulletin lists as of particular note Terrapin, which resembles Titian Sand, and Sombrero, a light beige, Crab Apple, used in combination with brown shades, Narcissus and Citrine, yellow tones, a brilliant Gladiolus and Ruby Red; and as conspicuous among sport colors a jade green, Aphrodite, a clear blue, Daphne and Tarragon Green. Enclosed also with the Color Card is a folder listing the code words designating each card issued, from 1916 to the present edition.

Technical Notes from Foreign Sources

Dyestuffs of the Indigo Tint

Dyestuffs yielding on cotton indigo blue tints which are fast to light, washing and chlorine are prepared by sulphurizing in the presence of benzidine and a flux, such as a mono or poly hydric phenol of the benzene or naphthalene series, the lecuoindophenol which is obtained by reducing the condensation product of nitrosophenol and carbazole. For example, 27.2 parts of the indophenol, which is obtained by condensing equimolecular parts of nitrosphenol and carbazole, are added to a fused mixture of 29 parts of crystalline sodium sulphide, 36 parts of powdered sulphur and 9.2 parts of benzidine, and the mixture is stirred until reduction is complete. The mass is dried in a vacuum, powdered, mixed with 8 parts of phenol, and heated at about 180 deg. Cent. until evolution of hydrogen sulphide ceases. After cooling and grinding, the product is extracted with a dilute solution of sodium sulphide, filtered and dried. The phenol may be replaced, for example, by alpha or beta naphthol or resorcinol. (British Patent No. 210,006.)

Improving Sulphur Dyeings

The "bronzy" streaks or spots, commonly called shades, that are usually obtained in dyeing with sulphur dyestuffs in the presence of an insufficient proportion of sodium sulphide, may be corrected by treating the dyed fabric with tannic acid. For example, a fabric dyed with a blue sulphur dye and showing bronzed spots or streaks is immersed for a period of 25 to 30 minutes in a bath containing 1.5 to 3 per cent of tannin per liter at a temperature of 60 to 75 deg. Cent., and is then rinsed and dried. This process is patented by the Society of Chemical Industry in Basle in British Patent No. 208,972.

Breaking Load of Single Cotton Hairs

In determining the various measurable characteristics of raw cotton, one of the tests made was to establish the breaking load of single cotton hairs. The determination of this constant for various kinds of cotton indicates that, for a pure strain cotton, the breaking load is largely dependent on the thickness of the walls of the cotton fiber and on the number of convolutions, but it is not dependent on the diameter of the cotton hair. In the case of Californian and Khanewal cottons having the same diameter, the breaking load of the former was nearly twice that of the latter. Fine cottons have a greater tensile strength than coarse cottons. After mercerization, without tension, with the aid of caustic soda of 40 deg. Tw., cotton hairs were more uniform in strength and had a breaking load 11.8 to 49.2 per cent greater than before. It is suggested that the percentage of hairs which break at loads below 1.5 grams be taken as an index of the amount of thin-walled of "dead" cotton. For further details see the Journal of the Textile Institute, Volume 15, pages 1-7.

Action of Formaldehyde on the Chlorine Bleaching Process

In the Textilberichte, Volume 4, pages 173-5, there is contained a report on the protective action that is exerted by formaldehyde in the bleaching process in counteracting the injurious effects of the presence of metals in the bleach liquor. The conclusions which were derived from this series of experiments are as follows:

1. Formaldehyde is oxidized by the hypochlorites to give carbon dioxide.

2. The rapidity of the bleaching operation and the degree of whiteness obtained are favorably affected by the presence of formaldehyde in the bleach liquor.

3. The resistance of the fabric to breaking is increased due to the fact that the presence of an excess of formaldehyde in the bleach liquor prevents the oxidation of the cellulose.

Tendering of Cotton Fibers by Acids

A comprehensive test was made with a number of samples of air-dried bleached cotton fabrics which were subjected to treatment with acids of various concentrations. The treatment lasted for various lengths of time, so as to determine the potency of the time factor as well. Thus, these samples were treated with various acid solutions, such as hydrochloric, sulphuric, hydrofluoric, acetic, monochloracetic and trichloracetic, at concentration of two normal, one normal and tenth normal. The time periods were one minute, fifteen minutes and one hour. The temperature at which the experiments were carried out varied and were fixed at 100, 60 and 40 deg. Cent. Then after the fabric had been washed and air-dried again, the breaking strength of the same was determined.

The conclusions which were derived from this series of experiments may be summarized as follows:

1. When the temperature is maintained constant, the loss of strength in the fabric is approximately proportional to the hydrogen ion concentration or in other words the strength of the acid.

2. When the temperature is increased, the loss in strength increases correspondingly.

3. The effects of the various acids differed in intensity, and the duration of the acid treatment also had a different effect in the case of one acid than in that of another. Thus samples of cotton were immersed in tenth normal solution of sulphuric acid hydrochloric acid. After a period of one minute had elapsed, the loss of strength in the first cotton fabric was 12 per cent and that in the second sample only 9 per cent, in other words, indicating that the effect of the two acids were not much different

when the fabric was subjected to their action for just one minute. Then the tests were repeated, but the fabrics were allowed to remain in contact with the acids for a period of fifteen minutes. In this case the loss of strength in the fabric treated with sulphuric acid was considerably less than that in the fabric submersed in hydrochloric acid, the respective losses being 32 and 54 per cent.

The tendering that is suffered by gray, gray desized and bleached samples of the same fabric was also investigated. The fabric samples were padded with known amounts of hydrochloric acid and then dried at a temperature between 100 and 120 deg. Cent. between electrically heated copper plates. The tests showed that tendering takes place when the fabric contains its own weight of 0.1 per cent hydrochloric acid and is dried at a temperature of 120 deg. On the other hand, the same fabric similarly impregnated with 0.05 per cent hydrochloric acid was severely tendered when dried at a temperature of 100 deg. Cent.

For further details the reader is referred to the Journal of the Textile Institute, Volume 14, pages 520-528.

Simultaneous Dyeing Process

British Patent No. 205,057 is concerned with a process of dyeing several layers of fabric wound on a cylinder or plaited down in laps, or of yarn wound on a cop. The dyeing is effected by squirting a dye liquor through the fabric or yarn at various points. The fabric or yarn may thus be partially dyed in one or more shades. The apparatus for squirting the dye liquor comprises a dye liquor reservoir and a pointed injector, the pressure employed being high, so that injection is rapid, and undesirable spreading of the liquor by capillary attraction is avoided.

BENZENE IN ITS RELATION TO THE AZO DYESTUFFS

(*Continued from page* 396)

goods are first prepared through a solution of 30 parts beta naphthol, 50 Turkey red oil, 20 caustic soda, 5 tartar emetic, 1,000 water. They are *immediately* dried on the drying machine, cooled off and run through the diazotizing solution made up as follows: Fifteen parts para nitraniline are dissolved in hydrochloric acid in sufficient water. To the ice-cold solution a solution of 10½ parts of nitrite of soda is added while stirring and more water added, and *just before using* 60 parts sodium acetate are added. The color is developed almost immediately. The dyed cotton is rinsed, soaped, rinsed and dried. A brilliant red is produced which is fast to soap but not to light.

If the paranitraniline used in the above is replaced by metanitraniline, a yellowish orange color is produced; with alphanaphthylamine a claret red is produced; with amido-azo-toluene a brownish red is producer; with benzidine a dark chocolate; with diamisidine a dark blue; and so on.

A DYEING PROBLEM

SPOTS ON PARA RED

PROBLEM EDITOR: One of the most puzzling difficulties that the writer ever experienced was in dyeing Para Red. A new padder was set up for applying the diazo solution, and the prepared cloth run through it, then dropped on a slide for a few folds and finally carried through a washing tub equipped with rolls and squeezer.

Brown to black spots appeared and persisted in the dried cloth. Brown scum was observed on the liquor in the padder and this was the obvious cause of the trouble. A laboratory check on the formula gave the same brown scum but other proportions of the ingredients were found which did not give it. Nevertheless the new formula did not work any better in practice than the old one.

Other sources of trouble, such as specks of rubber from the rolls and dirt from the ice were excluded, and several "authorities" gave as many explanations, which, however, were not found applicable.

It was noticed, however, that the spots on the dyed goods washed off readily even several minutes after they were formed and that gave the clue. It was decided that the formation of brown froth could not be entirely prevented, nor its sticking to the cloth and getting squeezed in, but permanent stains were prevented by putting on a spray pipe where the cloth entered the washer so as to give it a vigorous rinse.

There was nothing new in this idea. The function of the spray pipe simply was not appreciated and no one thought of so simple a remedy. In this case the principle of preventing the trouble did not work so well as letting the spots form and then getting rid of them afterward.

DU PONT THIOFLAVINE

E. I. du Pont de Nemours & Co. announce placing on the market as a new product Du Pont Thioflavine S, a direct dyestuff of a very brilliant greenish yellow shade, particularly adapted for silk and artificial silk. It may be used on cotton, dyes evenly and exhausts easily.

Its fastness to alkali and hot pressing is good. On half silk and half wool material both the cotton and wool are dyed to about the same depth—the cotton being slightly redder. It is not discharged by sulfoxylates and therefore can be used for producing color discharges.

In addition this company desires to announce that it has completely filled in its line of blacks adaptable to dyeing wool and leaving silk effect threads unstained, with the addition of Pontachrome Black SWG, Pontachrome Black SWR and Pontachrome Black SWBN. All of these blacks are said to dissolve easily and are level dyeing. They are applied on woolen goods containing pure silk threads by the top chrome method only, and when applied by this process the desirable properties sought for are obtainable.

DYESTUFF TABLES

(*Continued from page 405*)

Chemical Company; Sherwin-Williams Company; Newport Chemical Works; New York Color & Chemical Company.

ORANGE R
(Schultz No. 151)

COMPOSITION: Mono azo.

SPECIALLY SUITABLE FOR: Wool and silk.

USUAL METHOD OF DYEING: On wool with Glarber salt and sulphuric acid. On silk with boiled-off liquor broken with sulphuric below the boil.

SHADE: Redder than S-145.

SHADE BY GASLIGHT: No change.

SOLUBILITY: Excellent.

LEVEL: Fairly level.

EXHAUSTS: Well.

PENETRATION: Excellent.

FASTNESS TO:
Alkali: Fairly fast.
Fulling: Better than S-139 and S-144 and 145; after-treated with chrome improves it.
Ironing: Fast.
Light: Fairly fast to light.
Potting: Bleeds somewhat.
Rubbing: Fast.
Scouring: Bleeds somewhat; top-chromed better.
Steaming: Fairly fast to dry steaming.
Sulphur: Fast.
Washing: Bleeds somewhat, though better than S-144 and 145.

DYED BY OTHER METHODS: Top-chromed, faster to fulling and scouring.

ON UNIONS: Cotton-effect threads are left pure white.

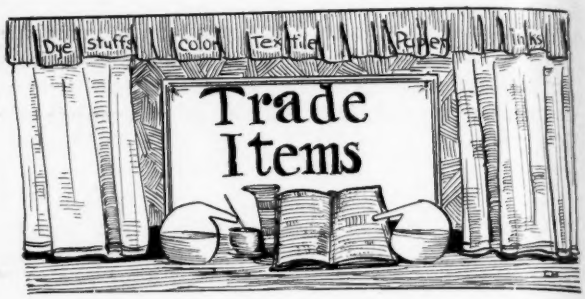
ON OTHER MATERIALS: Silk: Dyed in a bath of boiled-off liquor broken with sulphuric acid. Cotton: Dyed with alum and Glauber salt. Suitable for leather, jute and paper, and color lakes.

PRINTING: Adapted for printing on wool and silk, though the prints are not fast to water.

COMPETING PRODUCTS: Made in the United States by American Aniline Products, Inc.; E. I. du Pont de Nemours & Co.; Heller & Merz Company; National Aniline & Chemical Company.

CORRECTION

In the "Dyestuff Tables" that appeared in the June 2nd issue of The Reporter the name of the Newport Chemical Works, Inc., was omitted as a manufacturer of Erika 2GN. This company now makes this color and is offering it under the name of Newport Direct Fast Pink E2GN.



CREDIT TO DR. KNIGHT

In the June 2 issue of The Reporter, under the caption "New Dye Standard List Issued," there appeared an announcement of the new list of "Standards of Strength of Dyes, Colors, Etc.," which has been prepared by the customs division of the Treasury Department.

In the course of this announcement no mention was made of the very valuable service rendered by Dr. George W. Knight, Chief Chemist of the U. S. Appraiser's Laboratory at New York City. As a matter of fact, all of the work necessary in the preparation of this list was carried out under Dr. Knight's personal direction, and to him belongs the credit for having completed so satisfactorily a task of such monumental proportions.

NEWPORT DIRECT PINK E2GN

In response to the insistent demand from textile dyers for an American-made equivalent for Erika 2GN, the Newport Chemical Works, Inc., who have been manufacturing the B Extra Brand for some time, have devoted considerable research to this product and now have announced its production and availability. The market name is Newport Direct Pink E2GN, and the company advises that they are ready to make prompt deliveries. This brand, with the other already well-known companion products under the names of Newport Direct Fast Pink EBN and EB Extra, make possible again the production of certain goods which for beauty and unique characteristics are unapproachable.

A TREATISE ON PAPER DYEING

The Reporter has published in recent issues articles on paper dyeing and paper stock bleaching. The technical phase of this subject is gaining increased importance at present, doubtless owing to the popular use of colored paper products. Readers of these articles and dyers in paper mills will probably find very useful a new booklet, "Dyestuffs Data for Paper Makers," published by the Heller & Merz Company. It treats in a thorough manner with the selection and application of the colors used in the modern paper mill. The information this book contains was compiled with the valued co-operation of many paper mill superintendents and represents the results of thirty years' experience in the manufacture of paper-coloring chemicals.

Technical Books

A Compilation of the Most Useful Books on Dyeing, Bleaching, Finishing, Sizing, Printing, Textile Chemistry and Dye Chemistry, with Brief Descriptions and Contents of Each

FOLLOWING is the second installment of the list of technical books begun in The REPORTER of 2nd. The first half of the list included descriptions of books treating with the subjects of Dyeing, Bleaching, Finishing, Sizing, Waterproofing, Textile Printing, and Mixing and Testing of dyestuffs. The descriptions of these books will doubtless be of great value to readers who desire to install in their laboratory or dyehouse, for reference purposes or for general educational reading, a shelf of authoritative technical books.

DETERGENTS

MODERN BLEACHING AGENTS AND DETERGENTS

By M. BOTTLER

Translated by C. Salter

Contents: Old and New Methods and Agents; Sodium Peroxide Perborates; Ozone; Sodium Bisulphite and Hydrosulphurous Acid; Discharging Color from Textile Fabrics with Hydrosulphurous Acid; Permanganate; Hydrogen Peroxide; New Process for Bleaching Fats, Oils, Wax, Paraffin, Soap and Glue; Solid, Stable Calcium Hypochlorite and Bleaching Soda; Electric Bleaching; Benzine Soaps; Extractive Detergents and Detergent Mixtures; Properties of Carbon Tetrachloride; Aceto-Oxalic Acid as a Detergent; Special Methods of Removing Stains; Bleaching Processes Used in Chemical Cleaning; Hydrogen Peroxide; Oxygenol and Sodium Peroxides as Detergents; Sundry New Detergents and Cleansing Agents.

6¼x9¼, 160 pp., 16 Illust. V.....$2.50

THE MODERN SOAP AND DETERGENT INDUSTRY, INCLUDING GLYCEROL MANUFACTURE

By GEOFFREY MARTIN

Volume I—Theory and Practice of Soap Making

A complete practical treatise in three volumes on the manufacture of laundry, toilet, pharmaceutical, textile, abrasive, scouring and powdered soaps; also detergent compositions and soap substitutes of all kinds. Very full methods of analysis of the various products are given for the analytical and works chemist. There is a special study of patent literature for the inventor, chemical engineer and works manager in search of improvements. Volume I includes the lay-out of factories, raw materials of manufacture, calculation of charges, and the production of household and laundry soap.

6¼x10, Illustrated, tables. Cloth. V.....$10.00

TEXTILE SOAPS AND OILS

By GEORGE H. HURST and W. H. SIMMONS

A handbook on the preparation, properties and analysis of the soaps and oils used in textile manufacturing, dyeing and printing.

5½x8¾, 212 pp., 12 Illust. V.....$4.00

TEXTILE CHEMISTRY

THE CHEMICAL TECHNOLOGY OF TEXTILE FIBERS: Their Origin, Structure, Preparation, Washing, Bleaching, Dyeing, Printing and Dressing. (Second Edition, Revised.)

By GEORGE VON GEORGIEVICS

Translated from the German by Charles Salter

Contents: The Textile Fibers; Washing, Bleaching, Carbonizing; Mordants and Mordanting; Dyeing; Theory of Color; Theory of Dyeing; Classification of Dyestuffs; Dyeing on a Manufacturing Scale; Sample Dyeings; Printing; Reproductions of Patterns by Direct Printing; Combined Printing and Dyeing; Discharge Printing; Reserve Style Printing; Topping Printing; Dressing and Finishing; Starch, Gum and Fatty Substances; Hydroscopic Materials; Loading Ingredients; Coloring for the Dressing Preparations; Metals or Their Sulphites; Waterproofing; Fireproofing Antiseptics for Prevention of Mould.

5½x8¾, 431 pp., 47 Illust. V.....$7.00

CHEMISTRY OF HAT MANUFACTURE: Lectures Delivered Before the Hat Manufacturers' Association. (Revised and Edited by Albert Shonk.)

By W. SMITH

Contents: Textile Fibers, Principally Wool, Fur and Hair; Water, Its Impurities and Their Action; Acids and Alkalis; Boric Acid; Borax; Soap; Shellac; Wood Spirit; Stiffening and Proofing Process; Mordants; Dyestuffs and Colors; Dyeing of Wool and Fur; Optical Properties of Colors.

5x7¼, 131 pp., Illustrated. V.....$3.50

THE TECHNICAL TESTING OF YARNS AND TEXTILE FABRICS

By J. HERZFIELD

Translated from the German. Third edition, revised by D. T. Nisbet.

Contents: Microscopic Examination of Textile Fibres; Chemical Examination of Textile Fibers; Determining the Yarn Number; Testing the Length of Yarns; Examination of the External Appearance of Yarn; Determining the Twist of Yarn and Twist; Determination of Tensile Strength and Elasticity; Estimating the Percentage of Fat in Yarn; Determination of Moisture; Determination of the Mode of Weaving, Distinction and Combination of Warp and Weft Threads; Testing the Strength and Elasticity of a Fabric; Ascertaining the Count of Warp and Weft Threads in a Fabric; Determination of Shrinkage; Examining the Constituents of the Warp and Weft; Determination of the Dressing; Estimation of the Waterproof Properties of Cloth; Determining Hygroscopicity; Testing the Fastness of the Dye; Measuring the Length of Piece Goods; Determination of Mordants and Dyes; Detection and Estimation of Arsenic; Appendix.

A careful revision in which obsolete portions of the old edition have been discarded and additions made to bring the book into conformity with modern knowledge.

5¼x8½, 217 pp., 76 Illust. V.....$6.00

TEXTILES

By A. F. BARKER

With chapters on The Mercerized and Artificial Fibers and the Dyeing of Textile Materials (W. M. Gardner); Silk Throwing and Spinning (R. Snow); The Cotton Industry (W. H. Cook); The Linen Industry (E. Bradbury). A revised and up-to-date edition of this useful book, covering practically the entire range of textiles, and written for the student, the practical worker and all requiring practical, accurate information in connection with the textile industries.

5¾x8, 386 pp., Illustrated. Cloth. V.....$4.50

THE TEXTILE FIBERS: Their Physical, Microscopical and Chemical Properties.

By J. MERRITT MATTHEWS, PH.D.

This new edition gives all of the material available for the study of the textile fibers. It meets the needs of both the practical operator in textiles and the student of textile subjects, and is the outgrowth of a number of years of experience in the teaching of textile chemistry and in the practical observa-

tion of the many mill problems which have come under the notice of the author in the practice of his profession.

Contents: General Classification; Asbestos as a Textile Fiber; Wool: Its Origin and Classification; Physical Structure and Properties of Wool; The Chemical Nature and Properties of Wool and Hair Fibers; Action of Chemical Agents on Wool; Reclaimed Wool and Shoddy; Minor Hair Fibers; Silk: Its Origin and Cultivation; Physical Properties of Silk; Chemical Nature and Properties of Silk; The Vegetable Fibers; Cotton; The Physical Structure and Properties of Cotton; Constituents of Raw Cotton; Cellulose and Its Chemical Properties; Chemical Properties of Cotton; Chemical Treatment of Fabrics for Waterproofing and Flameproofing; Mercerized Cotton; The Minor Seed Hairs; Artificial Silks; Linen; Jute, Ramie and Hemp; Minor Vegetable Fibers and Paper Fibers; General Analysis of the Textile Fibers; Analysis of Textile Fabrics and Yarns; Testing of Textile Fabrics; Analysis of Fibers and Yarns in Fabrics.

6x9, 1,053 pp., 411 Figures. Cloth. W.....$10.00

DYES—INTERMEDIATES—DYE CHEMISTRY

THE ANALYSIS OF DYESTUFFS (Third Edition)

By Arthur G. Green

This work presents the revised and completed results of a series of investigations conducted by the author, with the assistance of various collaborators, during the past twenty years.

Contents: I. Introduction to Dyestuff Chemistry; II. Classification of Dyestuffs; III. Classification of Dyestuffs; IV. Analysis of Colouring Matters in Substance; V. Identification of Dyestuffs on Animal Fibres; VI. Identification of Dyestuffs on Vegetable Fibres; VII. Analysis of Indigo in Substance and Upon the Fibre; VIII. Analysis of Pigments and Lakes; IX. Determination of the Constituents of Azo Dyestuffs.

150 pp., 31 Analytical Tables.....$4.50

ANILINE AND ITS DERIVATIVES

By P. H. Groggins

Member American Institute of Chemical Engineers

This book is intended for the student of chemical engineering as well as the graduate engineer or works chemist. In discussing the manufacture of aniline derivatives the author has treated underlying theory and group reactions quite lightly, and emphasizes technique in the handling of materials.

Contents: Historical Introduction; Discussion of Reaction; Outline of Manufacture; Survey of Processes; Ferrous Chloride as Catalytic Agent in Reduction of Nitrobenzene to Aniline; Iron Borings; Manufacture of Nitrobenzene; Cost Factors in Manufacture; Thermal Factors in Reduction and Rectification of Aniline; Aniline Poisoning; Physical Constants of Aniline; Miscellaneous Chemical and Physical Data; Other Methods of Manufacture; Some Derivatives of Aniline; Résumé of Production and Distribution of Aniline; Action of Acids and Alkalis on Metals Used in Chemical Operations.

9¼x6¼, 263 pp., Fully Illustrated. V.....$4.00

ANTHRACENE AND ANTHRAQUINONE

By E. deB. Barnett

Contents: Introduction; Anthracene and Its Homologues; Simple Derivatives of Anthracene; The Anthraquinones and Dianthraquinonyls; Anthrone, Anthranol and Allied Products; Anthraquinone Ring Syntheses; The Benzanthraquinones; The Aldehydes, Ketones, and Carboxylic Acids; The Nitro, Nitroso, and Halogen Anthraquinones; The Sulphonic Acids, Mercaptans and Sulphides; The Aminoanthraquinones and Dianthraquinonylamines; The Hydroxy and Amino-Hydroxy Anthraquinones and Ethers; Pyridine and Quinoline Derivatives; The Acridones, Xanthones and Thioxanthones; The Benzanthones; The Cyclic Azines and Hydroazines; Miscellaneous Heterocyclic Compounds; Miscellaneous Compounds.

5½x8¾, 447 pp. V.....$6.00

CHEMISTRY OF COAL-TAR DYES (Second Edition, Revised and Enlarged)

By Irving W. Fay

Contents: Coal-Tar and Its Products; The Hydrocarbons and Their Derivatives; The Nitro and Nitroso Dyes; The Triphenylmethane Dyes; Classification of the Coal-Tar Dyes; Azo Dyes; Seven Food Colors; Pyronines; Indomines; Indophenols, Thiazines, Oxazines; Eurhodines and Safranines; Quinoxiline, Quinoline and Acridine Dyes; Aniline Black; Alizarine Dyestuffs; Indigo; Sulphur Dyes; Mordants; Vat Dyes; Thiazol Dyes; Experimental Works.

Intended for those students and dyers who have a good knowledge of general chemistry, and some knowledge of organic chemistry. The object is to present, briefly, the origin and history of coal-tar production, and a discussion of the intermediate products between the coal-tar and the dyes themselves. The methods of making the dyes are taken up, followed by a study of the relations of the great classes of dyes, and also the individual dyes themselves, to one another in the same class. The development of one color from another by a change in its composition is explained, and tables showing the variation of color accompanying change of composition are included. The proof of constitution is in many places given in such detail as to allow the student to comprehend the bases for the structure of the complex molecules of the dyes. The use of mordants and the character of the union between the dyes and animal and vegetable fibers are also included. A few manufacturing processes are introduced here and there in detail, to give clear conceptions of this phase of the subject.

6x9, 500 pp: V.....$5.00

COAL TAR AND AMMONIA (Fifth Thoroughly Revised and Enlarged Edition, in Three Volumes; Not Sold Separately)

By George Lunge

Abridged Contents: Coal Tar: Introductory; Process for Obtaining Coal Tar; Properties of Coal Tar and Its Constituents; The Applications of Coal Tar Without Distillation; The First Distillation of Coal Tar; Pitch; Anthracene Oil; Creosote Oil; Carbolic Oil (Middle Oil); Light Oil; Working Up the Light Naphtha into Final Products. Ammonia: Historical Notes on Ammonia; Sources from Which Ammonia Is Obtained; The Composition and Analysis of Ammoniacal Liquor, and Properties of Its Constituents; The Working Up of Ammoniacal Liquor into Concentrated Liquor and Liquid Ammonia; Manufacture of Sulphate of Ammonia; Other Technically Important Ammonium Salts.

This new edition will be of great importance, as six years have elapsed since the publication of the fourth edition, which has been out of print for some time. In preparing the revised issue the author is not only embodying in it all the new matter collected by himself on visits to factories and through communications with private sources, but also that which he has found in the books and periodicals published in the various industrial countries, and in the extremely numerous specifications of those countries.

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COAL TAR COLOURS IN THE DECORATIVE INDUSTRIES

By A. Clarke

A treatise dealing, in fairly simple terms, with the most up-to-date information available upon the use of coal-tar dyestuffs in lake making and in leather, fur, wood, paper, etc., coloring.

Contents: Introduction; Dyes; Dyeing, Dye Testing; Mordants; The Manufacture of Lakes and Pigments; Testing and Application of Lake Pigments; Staining and Dyeing of Wood; Dyestuffs in Oil and Spirit Varnishes; Paper Dyeing and Staining; Dyeing and Staining of Leather, Furs, Etc.; Miscellaneous Application of Coal Tar Colours; Index.

5x7¾, 179 pp. Illustrated. Cloth. V.....$2.00

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Coal Tar; Its Composition, Etc.; Lay-out of Tar Works; How Tar Is Received from Gas Works; Plant Used for Distillation of Tar; Distillation of Coal Tar; Plant for Recovering Carbolic and Creylic Acids from Oils; Recovery of Benzoles, Napthas, Etc.; Distillation and Washing; Rectification of Benzoles and Naphthas; Recovery of Pyridine Bases; Manufacture of Crude Naphthalene and Anthracene; Pitch and Pitch "Getting"; Creosote; Gas Stripping; Gas Works Tests.

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Gives clear account of the most important synthetic dyes and the intermediates from which they are derived. Being essentially a book on industrial chemistry, information of purely academic interest has been largely omitted.

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By R. Norris Shreve

Complete information—formulas, statistics, method of preparation, application and literature references—for 900 dyes classified under 487 intermediates. The statistical data covers the first six months of 1914, as well as later years, thus enabling a comparison of pre-war and later conditions. Indispensable for dye chemists, buyers of dyes, users of dyes, chemical merchants, analysts and textile experts.

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Translated by Frederick A. Mason

Deals with laboratory practice and forms a splendid introduction to the fundamental operations of dye chemistry. It describes the methods of production of the more important intermediates and covers the field of synthetic colors in its essential features.

Contents: Introduction. Intermediate Products; Sulphonations; Nitrogens and Reductions; Chlorinations; Oxidations; Condensations. Dyes: Azo Dyes; Triphenylmethane Dyes; Sulphur Melts; Miscellaneous Dyes; Summary of the Most Important Methods. Technical Details: Vacuum Distillations in the Laboratory and on the Works; Notes Upon the Construction and Use of Autoclaves; Structural Materials Used in Dye Chemistry; Technical Notes on Works Management; Example of Costing of a Simple Dye. Analytical Section: Analytical Details.

8 vo., 254 pp., 19 plates. Cloth. V.....$6.00

THE SYNTHETIC DYESTUFFS AND INTERMEDIATE PRODUCTS (Sixth Edition)

By J. C. Cain and J. F. Thorpe

A laboratory textbook for use in chemical laboratories and in colleges where higher organic chemistry is taught. Full of new information for chemists connected with works dealing with the synthetic dyestuffs. The first part of the book gives a detailed theoretical description of the intermediate products and the dyestuffs. The second part describes the preparation of one or more typical members of each of the groups of the intermediate products and dyestuffs. The methods of preparation are described and quantities are recommended which will enable the ordinary apparatus of the laboratory to be available, but the materials employed are only such as would be used by a chemist actually experimenting in a chemical works. Many of the tables and matters dealing with the application of dyestuffs have been adapted from the excellent handbooks issued by the various German dye works, especially those of the Farbwerke vorm. Meister Lucius & Bruning, Hoochst a/M.; Leopold Gassella & Co., Frankfort a/M., and of the Actien Gessellschaft fur Anilinfabrikation, Berlin.

Abridged Contents: Part I, Theoretical, Intermediate Products: 1. Coal Tar: Its Occurrence and Purification; II. Nitration; III. Sulphonation; IV. Amido-Compounds; V. Hydroxyl Compounds; VI. Carboxyl Compounds and Aldehydes; VII. Application of the Dyestuffs; VIII. Classification of the Dyestuffs; IX. The Nitroso-Dyestuffs; X. The Nitro-Dyestuffs; XI. The Azo-Dyestuffs; XII. Pyrazolones; XIII. Auramine; XIV. Triphenylmethane Dyestuffs; XV. Pyronine Dyestuffs; XVI. Acridine Dyestuffs; XVII. Anthracene Dyestuffs; XVIII. Diphenylamine Dyestuffs; XIX. Quinoxaline Dyestuffs; XX. Thiazol Dyestuffs; XXI. Quinoline Dyestuffs; XXII. Indigoid Colouring Matters; XXIII. The Sulphur or Sulphide Colours; XXIV. Xanthone Dyestuffs; XXV. A Short History of the Synthetic Colouring Matters. Part II. Practical: XXVI. The Technical Laboratory; XXVII. Preparation of Intermediate Products; XXVIII. Preparation of Intermediate Products; XXIX. Preparation of Dyestuffs. Part III. Analytical: XXX. Intermediate Products; XXXI. The Application of the Colouring Matters; XXXII. The Valuation of a Colouring Matter; XXXIII. The Analysis of Dyestuffs; XXXIV. Investigation of Dyestuffs on the Fibre. Appendix.

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A new translation of a book which has become a standard text in Germany, taking into consideration the huge developments on the technical side of dye chemistry that have taken place in recent years.

Contents: Introduction. Coal Tar; Intermediate Products for the Manufacture of Dyes; Coal Tar Dyes; Nitroso Dyes; Nitro Dyes; Azo Dyes; Diphenylmethane Dyes; Xanthrene Dyes; Quinoline Dyes; Anthraquinone Dyes; Hydroxyketone Dyes; Xanthone Dyes; Flavones; Naphthazarine Group; Quinoneimine Dyes; Acridines; Indigo; Vat Dyes; Sulphur Dyes; Murexide; Development of the Synthetic Dye Industry; Natural Coloring Matters; Mineral Colors; Literature of the Dye Industry.

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5x7½, 137 pp. Illustrated. V.....$1.25

MISCELLANEOUS

THE BRITISH COAL-TAR INDUSTRY: Its Origin, Development and Decline.

By Walter M. Gardner, M.Sc., F.I.C.

The history of the coal-tar industry is of great interest not only to the chemist and the student of industrial economics, but also to the politician, the leaders of industry, and even to the general reader. The first part of this book deals with the history and development of the industry, and the latter part with the problem as it has presented itself since the outbreak of war.

Contents: I. The Aniline or Coal-Tar Colours; II. The Artificial Production of Alizarine; III. The History of Alizarine and Allied Colouring Matters; IV. The Newer Artificial Colouring Matters Derived from Benzene; V. Indigo and Its Artificial Production; VI. The Colouring Matters Produced from Coal Tar; VII. Recent Progress in the Coal-Tar Industry; VIII. The Scientific Development of the Coal-Tar Colour In-

dustry; IX. The Origin of the Coal-Tar Colour Industry and the Contribution of Hoffmann and His Pupils; X. The Synthesis of Indigo; XI. The Relative Progress of the Coal-Tar Industry in England and Germany During the Past Fifteen Years; XII. The Indigo Crisis; XIII. Applied Chemistry, English and Foreign; XIV. The Relation Between Scientific Research and Chemical Industry; XV. History of the Coal-Tar Colour Industry Between 1870 and 1885; XVI. Note on the Perkin Jubilee; XVII. Perkin Obituary Notice; XVIII. The Founding of the Coal-Tar Colour Industry; XIX. Letter from Professor H. Caro to Professor R. Meldola; XX. Tinctorial Chemistry, Ancient and Modern; XXI. Patent Law in Relation to the Dyeing Industry; XXII. The Coal-Tar Colour Industry of England: Causes of Its Progress and Retardation; XXIII. The Artificial Colour Industry and Its Position in This Country; XXIV. The Supply of Chemicals to Britain and Her Dependencies; XXV. Britain and Germany in Relation to the Chemical Trade; XXVI. The Manufacture of Aniline Dyes in England; XXVII. German Chemical Industry Thirty Years Ago; XXVIII. The Manufacture of Dyestuffs in Britain; XXIX. The Chemical Industry of Germany; XXX. Patent Law Reform; XXXI. The Supply of Dyewares; XXXII. The Position of the Organic Chemical Industry.

437 pp. Illustrated. L.....$3.75

COLOR AND METHODS OF COLOR PRODUCTION

By L. C. Martin and William Gamble

An account of the present-day theory of color and of the methods which have been devised for the metrical study of the phenomena of color. The book will be useful to all interested professionally or as an amateur in color measurement or reproduction.

5¾x8¾, 200 pp. Full-Page Plates, Diagrams. Cloth. V. $4.00

FOREIGN EXHIBITS FOR THE CHEMICAL SHOW

Requests from European manufacturers of chemicals, dyestuffs, plant machinery and instruments for space in the 1925 Chemical Exposition have been received in larger numbers this year than on any previous occasion. German, Swiss, French and British manufacturers are anxious to display their goods in the American exposition when it is held at the Grand Central Palace, New York, September 28 to October 3, 1925. Since the termination of the war, each year has seen a larger number of foreign producers requesting space from the management. In former years applications from firms outside of the United States and Canada have been religiously rejected, in spite of the determined efforts of the foreign firms to display their goods in the "showroom" of the American chemical industry.

The next five years will be the most crucial in the history of the American chemical industry, according to the opinions of leading observers. The ability of the American producer of chemicals to withstand foreign competition, particularly from Europe, as the manufacturers of other nations regain their pre-war efficiency and readjust their businesses to the new order of things will determine where the future of chemical America will lie. At the present time, chemicals are overproduced in the United States, and opinion indicates that the only field where the excess can be sold is in the export markets. As a point of contact between the American manufacturer and the export consumer of both chemicals and equipment, the National Exposition of Chemical Industries has five men in the chief markets of the world working to interest the foreign buyer in American goods and to bring as many of the consumers as possible from other parts of the globe to the 1925 Chemical Exposition.

International Nickel Company reports for the year ended March 31, gross income of $3,025,654, against $1,282,271 in the previous fiscal year, and net profit of $1,206,786 after all expenses, taxes and reserves for depreciation and depletion, against net profit of $48,170 in the previous year. The net profit for 1924, after allowing for preferred dividends was $672,030, equal to 40 cents a share earned on the $41,834,600 common stock of $25 a share par value outstanding. In the previous year the company earned only 54 cents a share on the outstanding referred stock.

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Another example of the brilliant work being done by the dye experts in this country to make us independent of foreign control is shown by a recent announcement of the Ultro Chemical Corporation of New York, stating that after years of intensive effort they have perfected the manufacture of Alizarine Cyanine G Extra, and are now prepared to market this important dyestuff. The Standard Color Company, Inc., 43 Purchase Street, Boston, Mass., has been appointed sole distributors in New England and will carry a stock at their Boston warehouse sufficient to meet all requirements.

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Young man, technically trained, who knows both present and pre-war types, and having several years' experience in selling dyestuffs, wishes position with responsible and progressive dyestuff manufacturer or merchant. Can do own demonstrating. Southern territory preferred. Address Box 258, American Dyestuff Reporter.

SKEIN SILK DYER

WANTED—A dyer to act as assistant foreman, who is experienced in skein silk dyeing; knowledge of vat dyes required. Address Box 259, American Dyestuff Reporter.

SILK PIECE GOODS DYER

WANTED—A dyer who is experienced in the dyeing of silk piece goods, including all silk, silk and wool and silk and cotton. Address Box 260, American Dyestuff Reporter.

MATHIESON Chemicals

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ECONOMY in the modern textile mill demands an investigation of the question: *Why should we use a special textile soda in the kier-boil when half as much straight soda ash gives the same results at less than half the cost?*

Soda ash is a standard commodity of known composition and market price. Because of its practically 100 per cent detergent value, Mathieson 58 per cent Soda Ash (99.23 per cent sodium carbonate) is the most economical alkali for the kier-boil. Straight soda ash does the work of double its weight of special soda.

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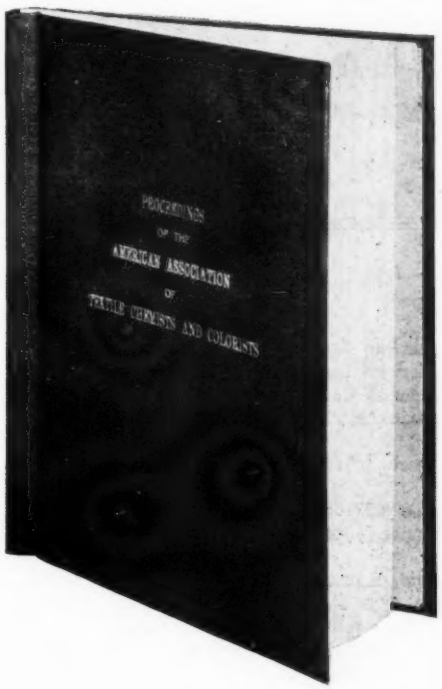

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PUBLISHED QUARTERLY

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